ENGINEER'S REPORT

Schedule I
Helicopter Parking Area

AIP Project No. 3-06-0012-021-2022

Auburn Municipal Airport

Auburn, California

Sponsored By:

City of Auburn

Federal Aviation Administration

Issued for Bid

February 24, 2022

3257 East Guasti Road, Suite 120
Ontario, California 91761

Phone 909-974-2700
Fax 909-974-2759

INTENTIONALLY LEFT BLANK

Table of Contents

Table of Contents (cont'd)

1. SCOPE OF WORK

a. Narrative

(1) Project Title.

Auburn Municipal Airport is a general aviation airport serving the community of Auburn, California. The Airport has been programmed to receive funding under the FAA Airport Improvement Program (AIP), consisting of one schedule of work, as follows:

Schedule I

Helicopter Parking Area

(2) Engineering Scope: Design, Bidding, and Construction Administration.

Design:
The focus of design for this parking area project is to design a new helicopter parking area able to accommodate the growing helicopter operations.

Existing Condition:
The existing location of the helicopter parking areas has completed its life-cycle and is in need of reconstruction. The site interferes with the operations performed by fixed wing aircraft and decrease overall safety in this vicinity.

Improvements:
The City of Auburn is rebuilding the parking area to accommodate the additional helicopter operations and improve the safety in the vicinity. The new proposed helicopter parking area is shifted west increasing the separation to Taxiway D.

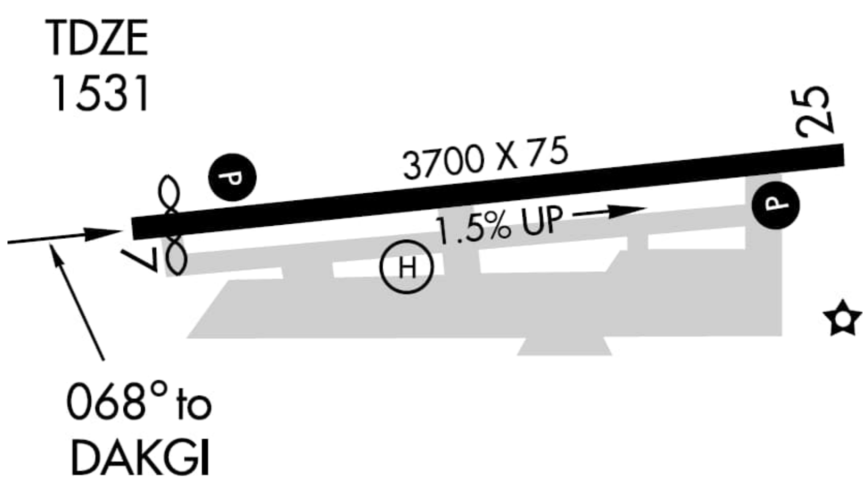


Exhibit A: Auburn Municipal Airport Diagram

(3) Project Background

Located south of Taxiway "A" and adjacent to Taxiway "D" connector are three helicopters parking positions. There are two positions west of Taxiway D and one position to the east of Taxiway D. These parking positions support both based and transient helicopter operations at AUN.

Recently Helicopter operations at AUN have increased significantly. These operations range from helicopter rides/tours, maintenance, training, powerline surveys, California Department of Forestry/Fire Protection, and California Highway Patrol. They make up a total of approximately 8 percent of total aircraft operations.

Airport management has seen a recent increase in helicopter activity as a result of flight training, law enforcement and other industrial helicopter traffic.

The existing location of the helicopter parking areas interfere with the operations performed by fixed wing aircraft and decrease overall safety in this vicinity. Helicopter parking areas are recommended to be relocated to provide standard parking areas that have proper separation from fixed wing operations. Both parking areas west and east off Taxiway D will be demolished and a new single apron parking area will be constructed. Eventually this portion of Taxiway D adjacent to the helicopter parking area will be decommissioned under a separate future project.

The existing 3 parking areas will not be able to accommodate all helicopter activity due to the increase in helicopter operations. With the projected number of helicopter operations that are forecasted at AUN, it's recommended to add an additional helicopter parking position when the relocated helicopter parking areas take effect.

Another main issue with the current layout is if there are two helicopter occupying the parking pad, only the helicopter closer to the taxiway is able to taxi out. Similarly, if there is a helicopter parked on the closest spot to the taxiway, another helicopter cannot get to the farther parking area. The lack of room at the current parking area makes the farther parking pad extremely inefficient and often times useless. The new parking area will have the taxi ways oriented so the helicopters will not have to taxi around other helicopters.

Currently, other aircraft that taxi from the apron south of Taxiway D will use Taxiway D to directly access the runway. Taxiing directly onto a runway from an apron without and prior turn is considered unsafe. To introduce a turn prior to taxing onto Taxiway D, there will be a "No Taxi Island" painted on the apron leading into Taxiway D. This "No Taxi Island" will require aircraft coming from any direction to make a turn to enter Taxiway D. The "No Taxi Island" will be painted green and is used only for visual reference for the aircraft.

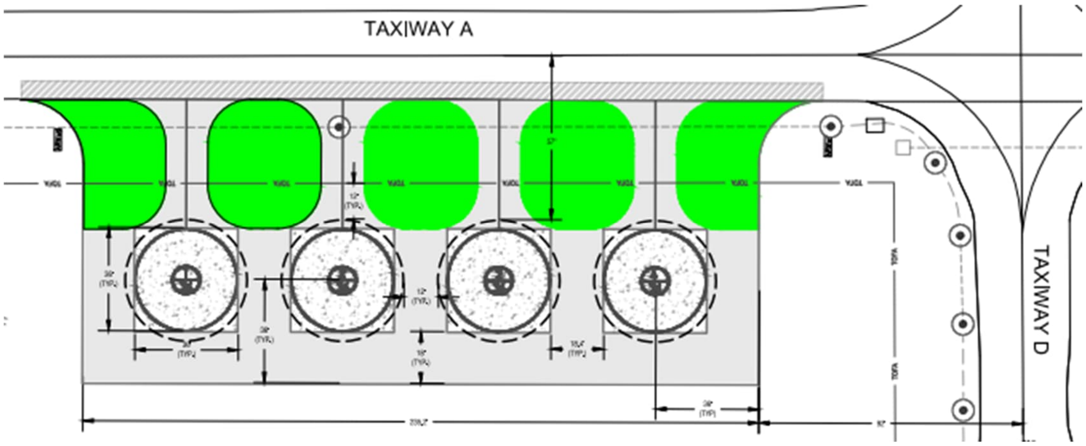


Exhibit B: Proposed Helicopter Parking Area

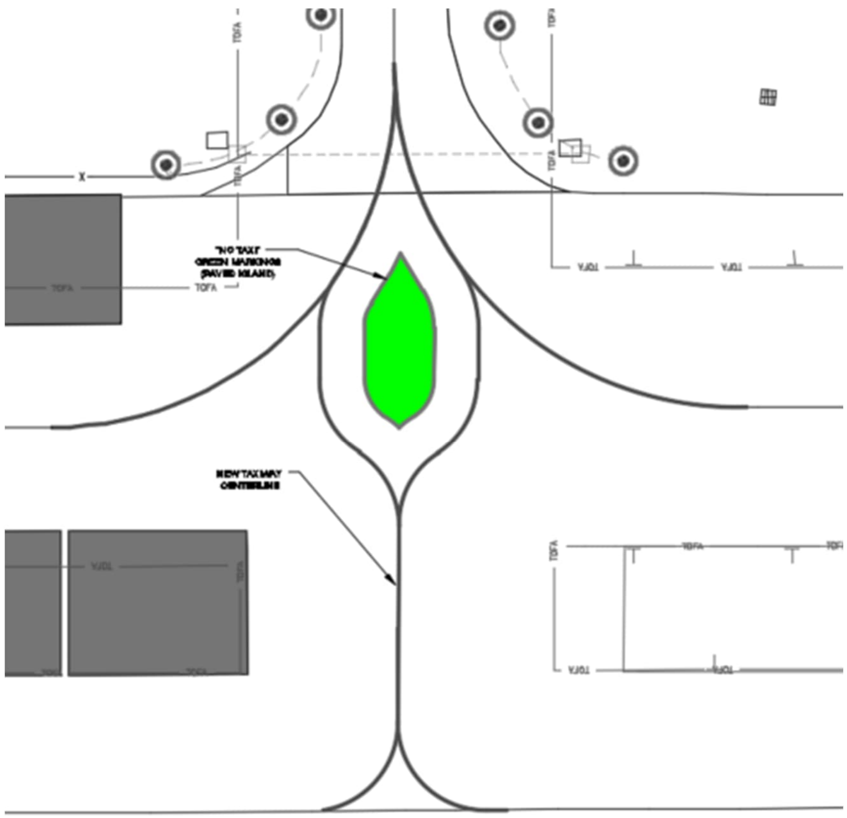


Exhibit C: Proposed Taxiway D No Taxi Island and Striping

b. Unique and Unusual Site Conditions

Work performed under this project will require closure of sections of the surrounding taxiways. The Contractor will be required to closely coordinate these closures with the airport and tenants to allow for the most efficient use of the aircraft parking aprons at any given time during the project. Foreign Object Debris (FOD) must closely monitored and managed. It is necessary to protect the surrounding area including the taxiway, parking apron, and the hangars.

c. Age of Existing Pavements

There is no know records identifying initial construction of the helicopter pads. It is estimated that the existing helicopter parking area were constructed in the late 70's or early 1980's.

d. Current Pavement Condition Index (PCI) Values

Not applicable to this project. The current parking areas to the west and east of Taxiway D will be demolished.

e. History of Work Performed in the Project Area

No overlay or reconstruction has been performed since original construction. The only maintenance completed are miscellaneous patch repair completed prior to 2003. The *2011 Airport Pavement Management System* identified the helicopter parking area having a PCI of 0 and in need of re-construction. There is no known maintenance since 2003.

2. PHOTOGRAPHS

3. LIFE CYCLE COST ANALYSIS

Concrete and asphalt will be the two main materials used to pave the helicopter parking area. The pad that the helicopter will park on will be constructed of concrete due to the need to support the entire weight of a helicopter. All other areas other than the parking pad will be constructed with asphalt. Asphalt will be used because it is a much cheaper, recyclable, and easier to repair material when compared to concrete. Asphalt will have the structural requirements to support the possible loads on it since the asphalt will only need to support the weight of minor traffic and fueling trucks

4. DESIGN STANDARDS

a. Design Aircraft

The Airport is designated as Approach Category B, Airplane Design Group I. A number of different types of aircraft utilize the Auburn Municipal Airport. The design helicopter for this project is the EuroCopter AS350. This is the primary helicopter used by the California Highway Patrol and will satisfy design requirements for all other potential helicopters that operate at AUN.

The parking area consists of 4 PCC pads surrounded by HMA. The layout followed the Section 413 Helicopter Parking in the AC. The PCC pads are square pads with a length equal to the design helicopters rotor diameter. Each pad is spaced equally so that the tail rotor arc of each parking area is 1/3 of the rotor diameter away. On each side of the PCC pads there is HMA with a width of ½ the design rotor diameter. The spacing of the pads along with the surrounding HMA gives ample room for fueling trucks to safely approach helicopters for fueling.

The width of the access taxilanes to each parking position is equal to two times the undercarriage length of the design helicopter; see Table 4-2 of the design AC 150/5390-2C.

b. Longitudinal / transverse grades for runways, taxiways, shoulders, aprons and safety areas

All helicopter parking area grades shall not exceed 2 percent in accordance with AC 150/5390-2C Heliport Design, Chapter 7 Heliport Gradients and Pavement Design, Section 705. Parking area gradients" which states, "Design all helicopter parking area grades to not exceed 2 percent." The helicopter parking area will be graded to match the existing grade of the taxiway at the tie-ins. The grading to the south of the parking apron will tie into the existing grade prior to the base of the existing fence as to not require any height adjustments to the fence.

The grading away from the pavement surface along the shoulder will be graded 2% based off of AC 150/5300-13A Airport Design Standards: Figure 3-38. Then it will slope away from the parking area shoulder graded between 3% to 5% as outlined in Figure 7-1 of AC 150/5390-2C Chapter 7. This will allow surface drainage away from the pavement go toward the proposed drainage swale. The high point of the drainage swell is located in between the apron and Taxiway D. It flows south and then to the west at a slope of 1.9%. This will ensure all runoff flows away from the parking area and towards the existing culvert under Taxiway E.

d. Object Free Areas

This project will take place within the Taxiway Object Free Area (TOFA) for Taxiway A and Taxiway D. It will be necessary to temporarily close these Taxiways during the construction of this project.

e. Runway line of site.

Not applicable to this project.

f. Threshold siting for displaced thresholds.

Not applicable to this project.

g. Runway and Taxiway Lighting layout color.

Runway Lights layout color. Not applicable to this project.

Taxiway Layout Color. Existing Taxiway Lights will be removed and replaced. Taxiway light color will be blue.

h. Site and aiming criteria for sponsor installed PAPI. Not applicable to this project.

i. Siting criteria for REILS or Sponsor Installed Approach light systems. Not applicable to this project.

5. ENVIRONMENTAL PROTECTION

Environmental factors pertaining to this project include impacts to air and water during construction. A Categorical Exclusion was completed in November 2018 and submitted to the FAA. The FAA provided letter of compliance in January 2019. A supplemental updated CATEX checklist was submitted October 2021 for geometric layout updated to the proposed project. The FAA provided a letter of compliance for the supplemental CATEX in October 2021.

The existing storm water system will be protected with pollution and erosion control BMPs to prevent possible contamination from spills and construction debris, as well as any and all permits the Contractor is required to file.

6. SOILS AND GRADING

An area of roughly 850 square yards will need to be excavated where the existing parking area sits. This excavation can be used as fill for the surrounding area to eliminate the need to export excavations. The new pavement area will encompass approximately 2,600 SY of new pavement. The topsoil that is remove will be safely stored on site during the construction of the project. After grading is complete, the saved topsoil will be reused where necessary.

Grading will be required between Taxiway A and around the new parking area. The area will be graded to fit the current drainage system. Water runoff will flow in a southerly direction and ultimately to the west of the parking area leading to the existing drainage swale and an existing storm culvert crossing Taxiway E.

The geotechnical report has identified soils stratus that may contains problematic soils. The unsuitable soils will be over-excavated and wasted on the site. A copy of the Geotechnical Report is located in Appendix B.

7. DRAINAGE

Currently, all runoff drains to the west of the existing parking area towards an existing storm drain. The new parking area must be able to handle an equal amount of runoff as the existing area. The high point for the new drainage is directly in between the proposed parking area and Taxiway D. Runoff will accumulate there and start to run towards the south end of the parking area. From there it will move toward the west where it will eventually match the existing grade and run towards the existing culvert under Taxiway E. A drainage and runoff analysis will be conducted to ensure the drainage meets airport standards.

8. PAVEMENT DESIGN

AC 150/5390-2C Helicopter Design dated April 24, 2012 was used to identify the dimensional standards and criteria for the helicopter parking area. The parking area was designed to accommodate the EuroCopter AS350. The EuroCopter AS350 helicopter is the largest helicopter that lands in AUN, thus the parking area will be able to accommodate all helicopter operations at AUN.

Section 708. Pavement design and soil Stabilization was utilized as guidance to develop a concrete pavement thickness capable of supporting the design aircraft.

Section (a) states "In most instances, a 6-inch thick (15 cm) portland cement concrete (PCC) pavement is capable of supporting operations by helicopters weighing up to 20,000 pound."

EuroCopter AS350 Max Takeoff Weight: 4,960 lb < 20,000 lb

Section 708. Pavement design and soil Stabilization states "In some instances, loads imposed by ground support vehicles may exceed those of the largest helicopter expected to use the facility." For this reason, the fuel vehicle will be utilized for pavement design of the apron area utilizing AC 150/5320-6, Airport Pavement Design.

Based on Table 3-3 states 3 inches HMA is required, however the fueling trucks are typically heavier and can cause pre-mature stress and deterioration. To counter this, the HMA thickness is upsized to 4 inches.

9. RECYCLING

All millings shall remain on airport property. Exact location shall be coordinated between the airport and the contractor.

10. MATERIAL AVAILABILITY

The Auburn area has an adequate number of material manufacturers and suppliers to service this project. Prior to bidding, these contractors and suppliers will be notified of this project to increase bid interest.

11. PAVEMENT MARKING

The pavement markings for this project will consist of new helicopter parking area circles, identifier markings, green no taxi islands for the helicopter parking area, green no taxi island for Taxiway D, and new Taxiway Centerlines leading to Taxiway D.

Each parking area circle will have a diameter equal to that of the design helicopter (36 feet). The parking position identifier markings will have the number of the parking spot and a marking showing the maximus rotor diameter a helicopter can have if it wished to park at the spot.

The no taxi islands for the helicopter parking area and the apron leading to Taxiway D will follow the guidelines from AC 150/5340-1M, Standards for Airport Markings "Section 1.5.1 Safety Enhancements". This section describes the requirements for painting a no taxi island for the scenarios we encounter on in this project. The no taxi islands will require a double continuous yellow taxiway edge markings with solid green paint starting from the edge of the inside yellow taxiway edge marking. These markings will act solely as a visual indicator for helicopters and other aircraft. There will be no modification to the actual pavement.

New taxiway centerlines will be required on the apron leading to Taxiway D to navigate around the proposed no taxi island. AC 150/5340-1M, Standards for Airport Markings. "Section 4.2 Taxiway Centerline Markings" recommends all taxiway centerlines to be 6" yellow continuous markings.

12. SIGNAGE

Non-lit information signs will be installed on each side of the helicopter parking apron, along Taxiway A, to guide pilots to the parking area. This will also ensure that any fixed wing aircraft can recognize the area as being only for helicopters, so they will not attempt to taxi to or park on the apron.

13. LIGHTING

Taxiway lighting will be removed and reinstalled, where possible. The existing lighting cable will be removed and disposed of off-site. Semi-flush taxiway edge lights will be installed along the south edge of Taxiway A intersecting with the point of tangency (PT) of the parking position connectors. The taxiway connectors leading to the parking hardstands will be marked using taxiway edge reflectors (L-853). Elevated taxiway edge lights will be installed along the north edge of Taxiway A, aligned with the lights at the PTs. Light layout will be in accordance with FAA AC 150/5340-30J.

The airfield lighting duct that will be under the proposed apron pavement will be removed. Concrete encased 2-inch schedule 40 PVC conduit will be installed below the proposed taxiway connectors leading to the parking hardstands. The proposed lights will be interconnected using FAA L-824, Type C #8 AWG cable.

14. FAA OWNED FACILITIES

FAA owned facilities will not be affected by this project.

15. NON-AIP WORK

All work described herein is eligible for FAA funding.

16. ENGINEER’S ESTIMATE OF PROBABLE CONSTRUCTION COSTS

a. Engineer’s Estimate of Probable Construction Costs

- Schedule I: $806,700.40

See breakdown below of items and unit costs.

				Cost	
ITEM NO.	DESIGNATION	Unit	QTY	Unit Cost	Total
General					
C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1	$37,500.00	$ 37,500.00
C-102-5.1	Erosion Control	LS	1	$20,000.00	$ 20,000.00
C-105-6.1	Mobilization	LS	1	$65,000.00	$ 65,000.00
P-101-5.1	Concrete Pavement Removal	SY	50	$50.00	$ 2,500.00
P-101-5.2	Asphalt Pavement Removal (Complete)	SY	1297	$25.00	$ 32,425.00
P-101-5.3	Asphalt Pavement Removal (Partial)	SY	280	$20.00	$ 5,600.00
P-101-5.4	Remove Elevated Light and Foundation in Turf, (Complete)	EA	2	$250.00	$ 500.00
P-101-5.5	Remove Electrical Duct Bank	LF	360	$20.00	$ 7,200.00
P-152-4.1	Unclassified Excavation	CY	1000	$20.00	$ 20,000.00
P-152-4.2	Unsuitable Excavation	CY	165	$20.00	$ 3,300.00
P-152-4.3	Subgrade Preparation	SY	2,600	$5.00	$ 13,000.00
P-209-5.1	Crushed Aggregate Base Coarse	CY	800	$65.00	$ 52,000.00
P-209-5.2	Separation Geotextile	SY	2,600	$5.00	$ 13,000.00
P-401-8.1	Bituminous Paving Course	TON	650	$200.00	$ 130,000.00
P-401-8.2	Modified Bituminous Material (PG64-28)	TON	50	$800.00	$ 40,000.00
P-501-8.1	Portland Cement Concrete Pavement (6")	SY	580	$200.00	$ 116,000.00
P-603-5.1	Emulsified Asphalt Tack Coat	GAL	310	$9.00	$ 2,790.00
P-604-6.1	Compression Joint Seals for Concrete Pavements	LF	576	$10.00	$ 5,760.00
P-605-5.1	Joint Seal Between Asphalt and Concrete	LF	576	$5.00	$ 2,880.00
P-620-5.1	Permanent Pavement Marking	SF	8254	$5.00	$ 41,270.00
P-620-5.2	Temporary Pavement Marking	SF	8254	$3.00	$ 24,762.00
F-162-5.1	Install Chain-Link Fence with Slats	LF	173	$175.00	$ 30,275.00
T-901-5.1	Seeding	AC	3	$2,800.00	$ 8,400.00
L-108-5.1	Install #8 AWG, 5000V, L-824 Type C Cable	LF	825	$3.00	$ 2,475.00
L-108-5.2	Install #6 AWG, Bare Copper Counterpoise	LF	260	$3.00	$ 780.00
L-108-5.3	Install #2 AWG, 600V, XHHW-2	LF	783	$3.00	$ 2,349.00
L-108-5.4	Install #4 AWG, 600V, XHHW-2	LF	456	$3.00	$ 1,368.00
L-110-5.1	Install 1-Way, 2-Inch PVC Conduit in Turf (DEB)	LF	179	$20.00	$ 3,580.00
L-110-5.2	Install 2-Way, 2-Inch PVC Conduit in Turf (DEB)	LF	152	$20.00	$ 3,040.00
L-110-5.3	Install 1-Way, 2-inch PVC Conduit (CE)	LF	190	$35.00	$ 6,650.00
L-125-5.1	Install L-861T (L), LED, Taxiway Edge Light on New Base, Complete	EA	9	$1,200.00	$ 10,800.00
L-125-5.2	Install L-852T (L), LED, In-PavementTaxiway Edge Light on New Base, Complete	EA	8	$2,500.00	$ 20,000.00
L-125-5.3	Install L-853 Retroreflective Taxiway Edge Marker - Surface Mounted	EA	24	$250.00	$ 6,000.00
L-125-5.4	Install Duplex Convenience Receptacle With Weatherproof Cover	EA	4	$40.00	$ 160.00
L-125-5.5	Install L-858, Size 1, Style 4, Stake Mounted Guidance Sign	EA	2	$1,000.00	$ 2,000.00
				Subtotal	**$ 733,364.00**
				Contingency (10%)	**$ 73,336.40**
				Total Construction Cost:	**$ 806,700.40**

17. PRECISION APPROACH PATH INDICATORS

This is not applicable to the project as the scheduled work does not impact the approach.

18. MODIFICATIONS TO STANDARDS

No modifications to standards are expected for this project

19. DBE PARTICIPATION

A DBE plan is currently being updated under this project. A plan will be submitted to the FAA Civil Rights Office for approval. A goal will be established for FY 2022-2024. All work items identified for this project are suitable for participation by available DBE's firms.

20. BUILDINGS

Directly south of the parking area exist several hangars. These hangars will be protected. The existing slated fence that protects the hangers will be extended to the west to cover all existing hangars.

21. EQUIPMENT

Barricades are required on the project to delineate construction limits. Barricades will follow all requirements in FAA AC 150/5370-2G. Low profile barricades will be placed within the active taxiway safety area or any temporary closure of an active taxiway.

22. AIRPORT OPERATIONAL SAFETY

Contractor will be required to perform all work in accordance with the current requirement of AC 150/5370-2G, Operational Safety on Airports During Construction.

See sheet G005, Construction Phasing Layout Plan, of the project drawings for detail on the closure recommendations.

See sheet G003, Construction Operation and Safety Plan, of the project drawings for detail on construction operations.

A Construction Safety and Phasing Plan will be submitted under separate cover.

23. MISCELLANEOUS WORK ITEMS

No additional work items are expected on this project.

24. PREDESIGN MEETING MINUTES

A predesign meeting was completed on September 16, 2020.

Additionally, a Stakeholder Outreach Meeting was completed with the Auburn Aviation Association Airport Advisory (5AC). The goals for the project was to present the proposed project and with stakeholders and solicit input and participation. The meeting was held during the Airport's regularly scheduled and publicly advertised Auburn Aviation Association Airport Advisory (5AC) committee meeting held on October 22, 2020.

Design Kickoff Meeting Minutes and Stakeholder Outreach Meeting Agenda are included in Appendix A

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A

Pre-Design Meeting Minutes

Jacobs

Meeting Minutes

400 Industry Drive, Suite 100
Pittsburgh, Pennsylvania 15275
United StatesT +1.412.249.6495

Subject	**Design Kickoff Meeting Minutes**		
Project	Helicopter Parking Area		
Project No.	W9Y24604	**File**	Kickoff Design Meeting Minutes 20200916
Prepared by	Jacobs	**Phone No.**	
Location	TEAMS Meeting	**Date/Time**	16 SEPT 2020 / 1000 - 1100 PST

Participants

Reginald Dones – FAA Program Manager – reginald.dones@faa.gov
Joanne Manson – FAA Airport Planner – joanne.manson@faa.gov
Davis Spencer – City of Auburn Fire Chief/Airport Manager – dspencer@auburn.ca.gov
Chris Ciardella – City of Auburn City Engineer – cciardella@auburn.ca.gov
Justin Ritter – Sr. Planning Advisor – justin.ritter@leighfisher.com
Jesus Moncada – Jacobs Project Manager – jesus.moncada@jacobs.com

Objectives: The purpose of this meeting is kickoff the design for the Helicopter Parking Area project at the Auburn Municipal Airport and verify the project scope and expectations, discuss the design development, highlight coordination issues, etc. with the team ahead of full design beginning.

Notes		Action Required
1	Introductions/Org Chart	Jacobs to provide meeting minutes and attendees list.
2	Project Location a. The favored location identified in the ALP Narrative is at the current helicopter parking area west of Taxiway D; between apron and Taxiway A.	Jacobs to provide signed ALP set to FAA to verify project.
3	Haul Rout/Access Route a. Utilize same route as previous projects. The preferred haul route will be from Bell Avenue to New Airport Road to Earhart Ave to Lindberg St. to Airport.	Jacobs to provide updated exhibit if haul route changes.

Notes		Action Required
4	Existing Site Conditions a. The existing helicopter parking area location of the will be utilized for this project. The existing pavement is concrete hard stand with surrounding asphalt. The existing pavement will be analyzed to determine if it can be utilized within the design. b. The existing pavement leading to helicopter parking area will be removed. A new access will be provided from Taxiway A. c. Paint markings on existing pavements to remain will be adjusted to depict where aircraft can taxi and or access the project at completion.	Jacobs will include a demolition plan identifying they existing pavement that may be removed. Jacobs will provide a pavement marking plan to depict markings on the airport.
5	Design Aircraft a. The largest helicopter that will utilize the parking area is the Eurocopter AS350 which is used by California Highway Patrol. Since it is the largest helicopter we will consider it the design aircraft and will design the parking area to accommodate it.	Jacob to review all helicopter traffic and may updated as design progresses.

Notes		Action Required
5	Pavement Design and Geometrics a. Jacobs will review the FAA Advisory Circular 150/5390-2C Heliport Design to determine best geometric layout. The final layout will make best use of the parking area. Its anticipated the helicopter parking areas will most likely include both PCC and AC pavements to maximize cost. b. Jacobs will review Advisory Circular 50/5320-6F Airport Pavement Design and Evaluation and review the geotechnical report and to determine the best and most cost-effective pavement section thickness to meet the loading requirements. In particular the report will help evaluate the existing subgrade to determine the proper compaction that will be required. c. Additionally, the geotechnical report will evaluate the subgrade to determine the California Bearing Ratio (CBR) and Subgrade Reaction Modulus (K- Value) that will aid in the pavement design. d. Critical dimensions to point out are its rotor diameter, undercarriage length, tail rotor arc, and takeoff weight. These specifications will be what determine the size and spacing of the parking area. e. The grading and drainage will meet the current FAA Advisory Circular 150/5300-13A Airport Design requirements. Drainage will be collected along the existing drainage swale that parallels Taxiway A and drain in a westerly direction ultimately collected in the existing drainage swale that funnels the drainage toward the west and across Taxiway E and ultimately off airport property.	Jacobs will review the AC criteria to develop the helicopter parking area that meets the design criteria for spacing and setbacks. Jacobs will review the Geotech report and develop a paving thickness required for the aircraft loading.

Notes		Action Required
6	Construction Phasing a. The project site will be phased and coordinated to minimize disruption to aircraft taxiing operations. Low profile barricades will be utilized to block access to the project site by placing barricades along the entrance to Taxiway D at the apron interface with the apron, barricading Taxiway A between Taxiway D and Taxiway E. b. Aircraft will have unimpeded access on the remaining airfield and apron pavement. As the design develops the phasing may be refined and adjusted to accommodate operations. c. The phasing plan will be coordinated with the Construction Safety and Phasing Plan (CSPP). Draft CSPP will be submitted at the 50% submittal and updated for final 100% submittal. d. Jacobs will set construction duration on the construction to minimize construction impacting Taxiways A, and D. e. Contractor Staging area will be located at the westerly end of the hangars.	Jacobs to prepare CSPP and submit through the OE / AAA site and cc Reginald Dones as well.
7	Schedule a. Schedule was developed showing milestone submittals and review periods. David Spencer (AUN) indicated the city is generally closed around the holidays and not available for reviews. b. David Spencer requested consideration be given to stakeholder and 5AC committee to review plans. This may extend the schedule.	Jacobs will revise the project schedule to allow proper reviews and accommodate holiday schedule.

Notes		Action Required
8	Field Investigation Activities a. This project will require topographic survey and geotechnical investigations. Jacobs is currently working through subcontracting items and will schedule on-site activities as soon as possible to meet deliverable dates. b. Topographic Survey will be completed by NV5 (formally Andregg Inc.) They have done survey for us on previous projects. c. The geotechnical investigation will be completed by NV5 (formally Holdrege and Kull). They have previous experience working at the airport as well.	Jacobs will schedule the subs and coordinate with AUN for access to the airport.
9	DBE Plan a. Currently the DBE plan is outdated and covered projects completed through 2018. The DBE plan will be updated to get back on 3-year cycle. b. Jacobs contacted Ofelia Medina – FAA Compliance for direction on proceeding with updating the plan. The DBE plan will be updated for 2020 and 2021. c. A new DBE plan will be required to be submitted 2021.	Jacobs will update the DBE plan for 2020 and 2021 per FAA direction.
10.	ALP Jacobs provided confirmation of the signed ALP drawings highlighting the project as requested by FAA. An electronic copy will be sent to Joanne Manson and Reginald Dones.	Jacobs to provide AUN with a high-resolution copy to send to FAA.
11.	Design Meetings Jacobs start design meetings next week and invite the attendees to make sure the design proceeds on schedule and issues are addressed and mitigated in a timely manner.	Jacobs to schedule the weekly design meetings. It appears Thursday is day of choice.

Helicopter Parking Apron (AUN)

Kick-off Meeting

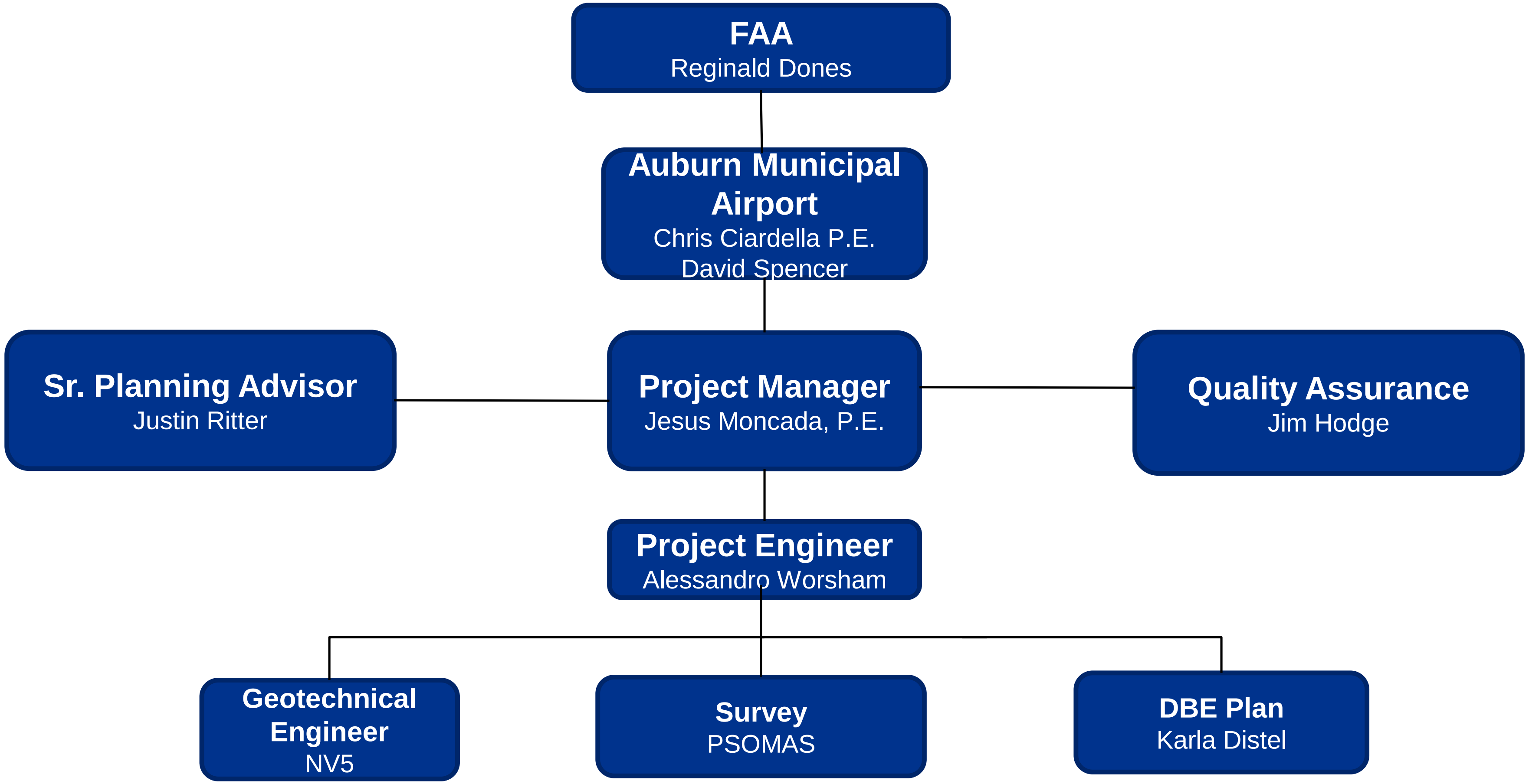
September 16, 2020

Challenging today.
Reinventing tomorrow.

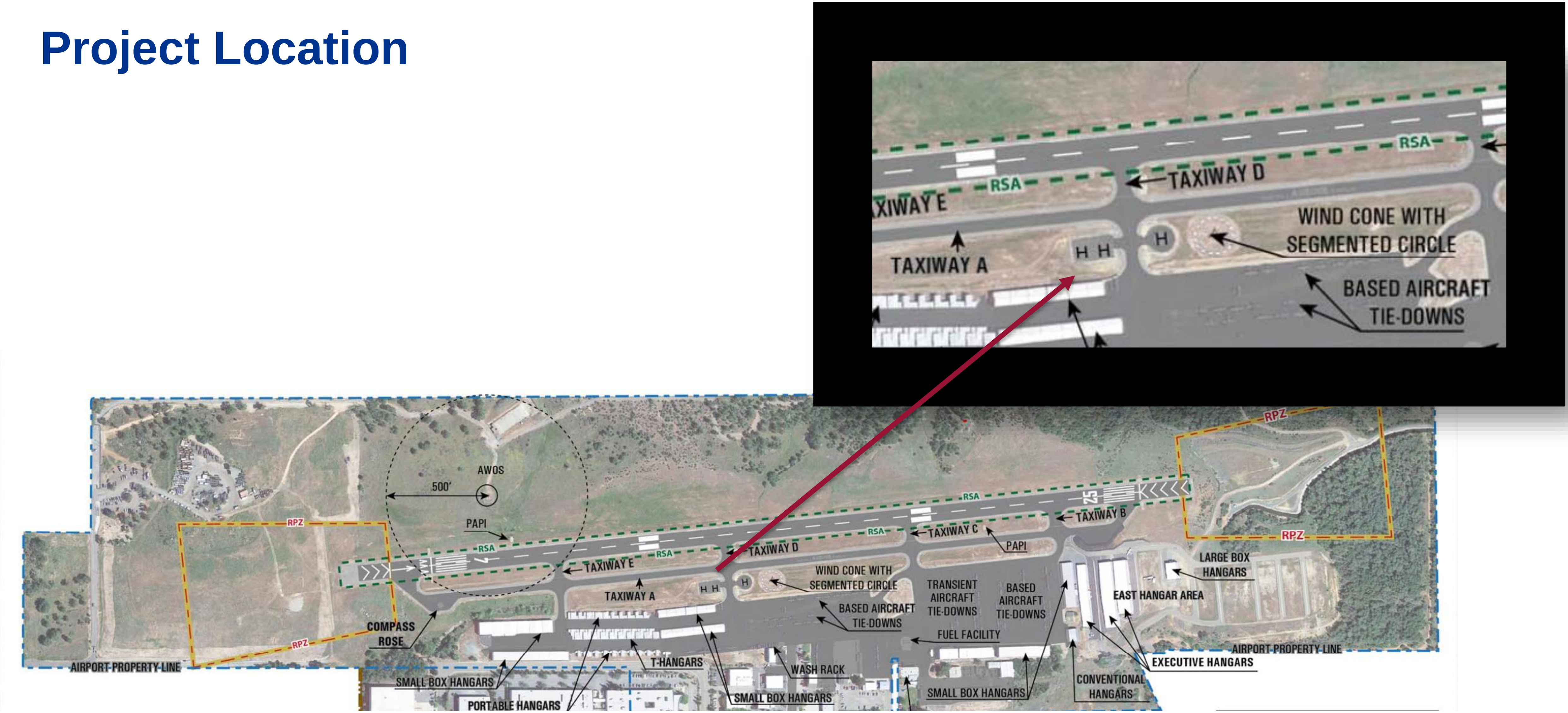
Agenda

1. Introductions
2. Design Team Roles and Responsibilities
3. Project Overview
4. Design Criteria
5. Construction Phasing Concept
6. Project Deliverables and Schedule
7. Field Investigation Activities
8. DBE Plan and Goals
9. Questions

Design Team Roles and Responsibilities

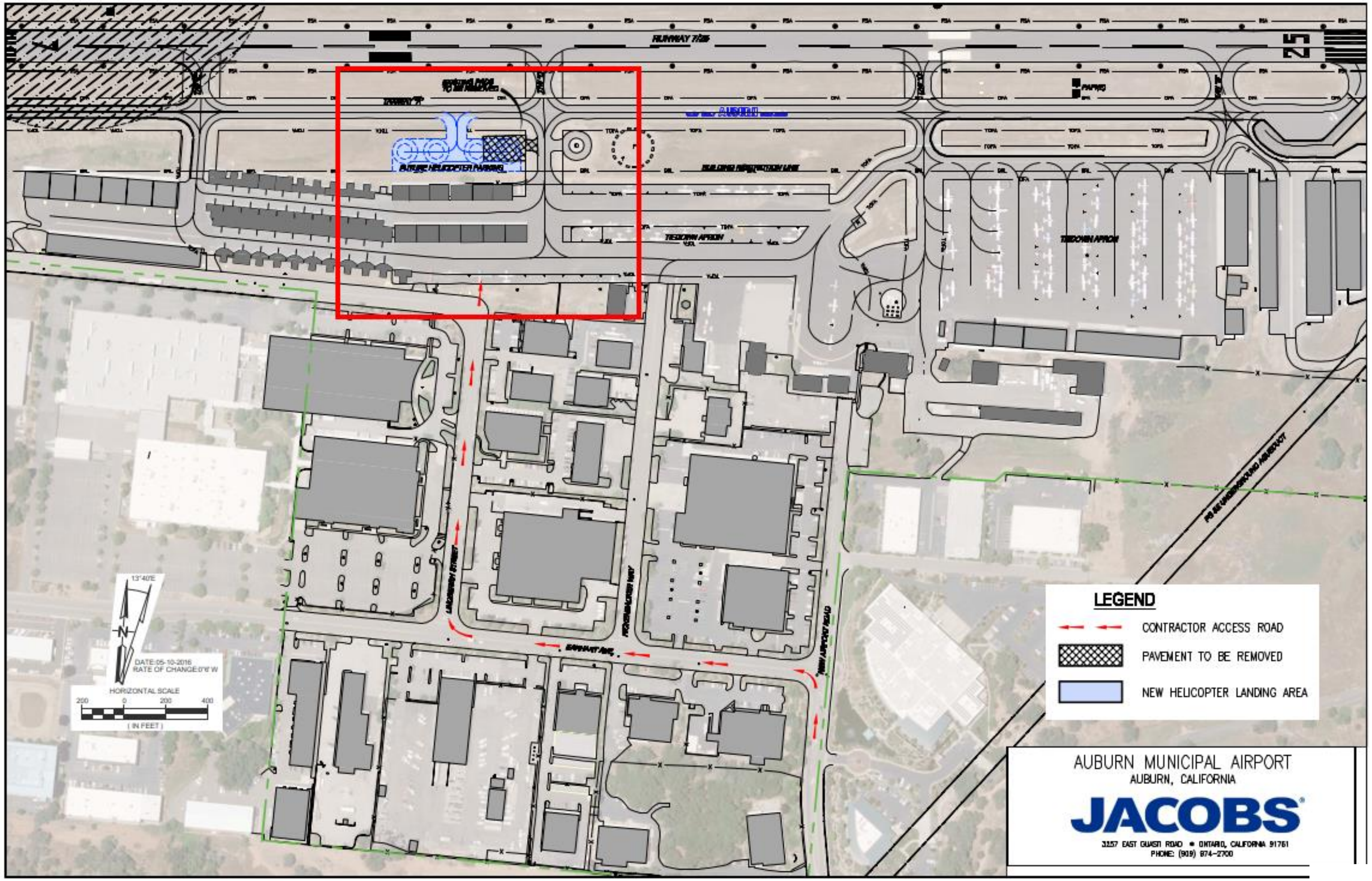


Project Location



Jacobs Challenging today. Reinventing tomorrow.

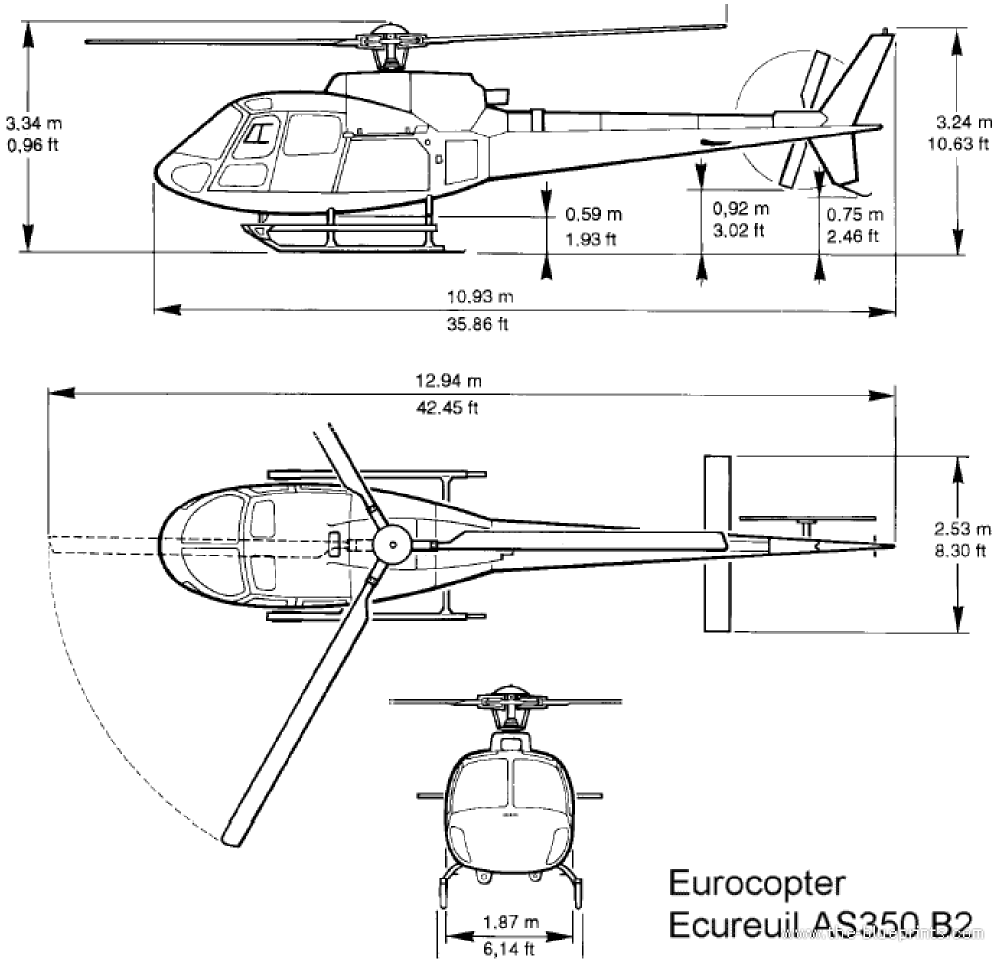
Project Haul Route



Challenging today.
Reinventing tomorrow.

Existing Site Conditions

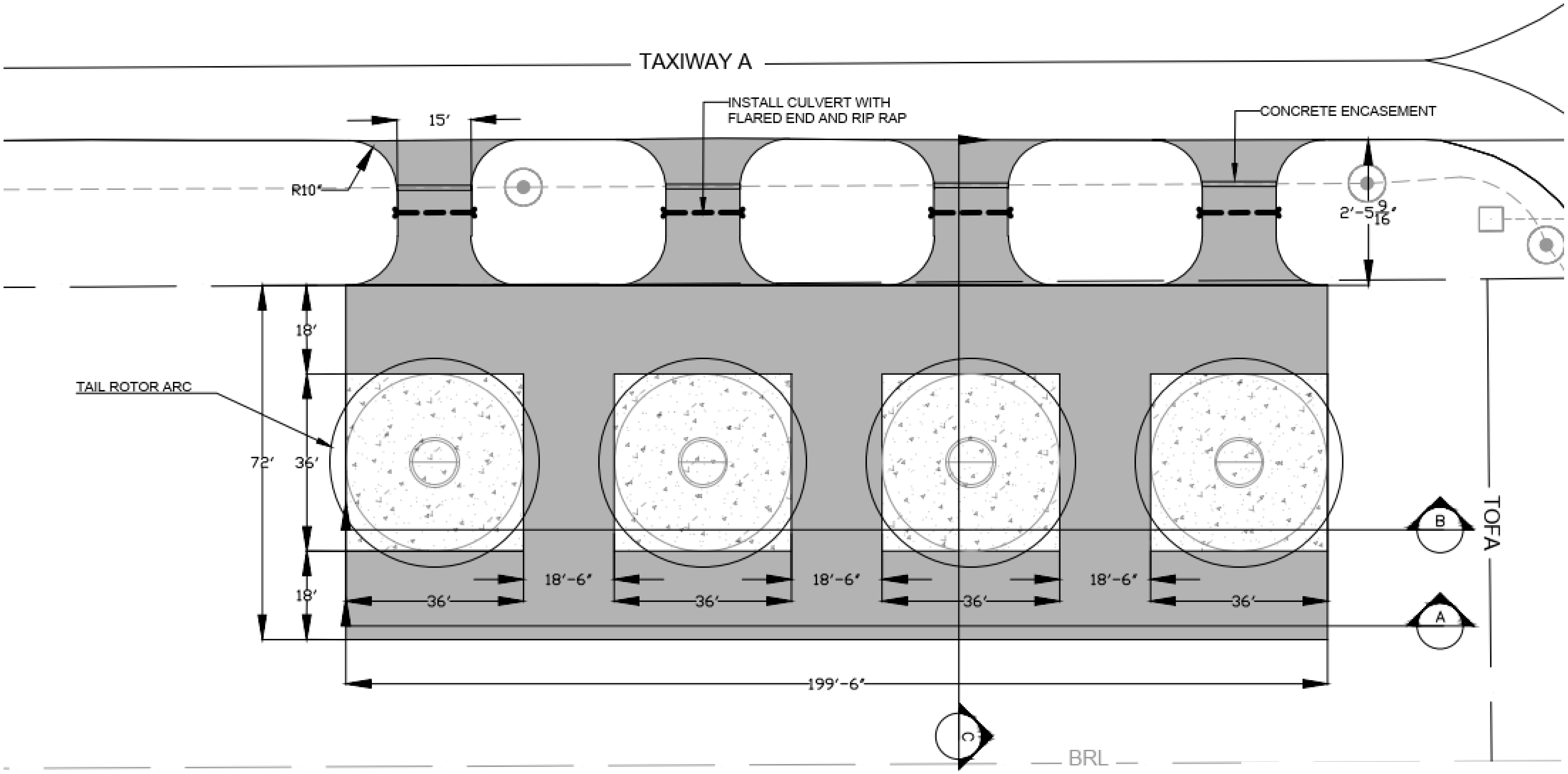
Design Helicopter



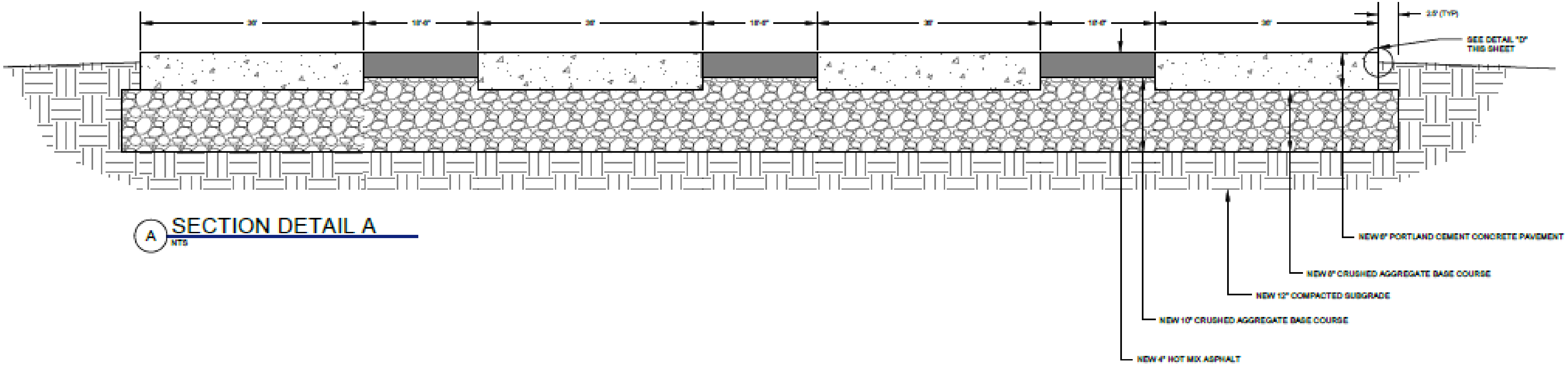
Eurocopter AS350

- Rotor Diameter (RD): 35’ 1”
- Undercarriage Length (D): 35’ 10”
- Tail Rotor Arc: 42’ 6”
- Max Takeoff Weight: 4,960 lb

Pavement Design and Geometrics

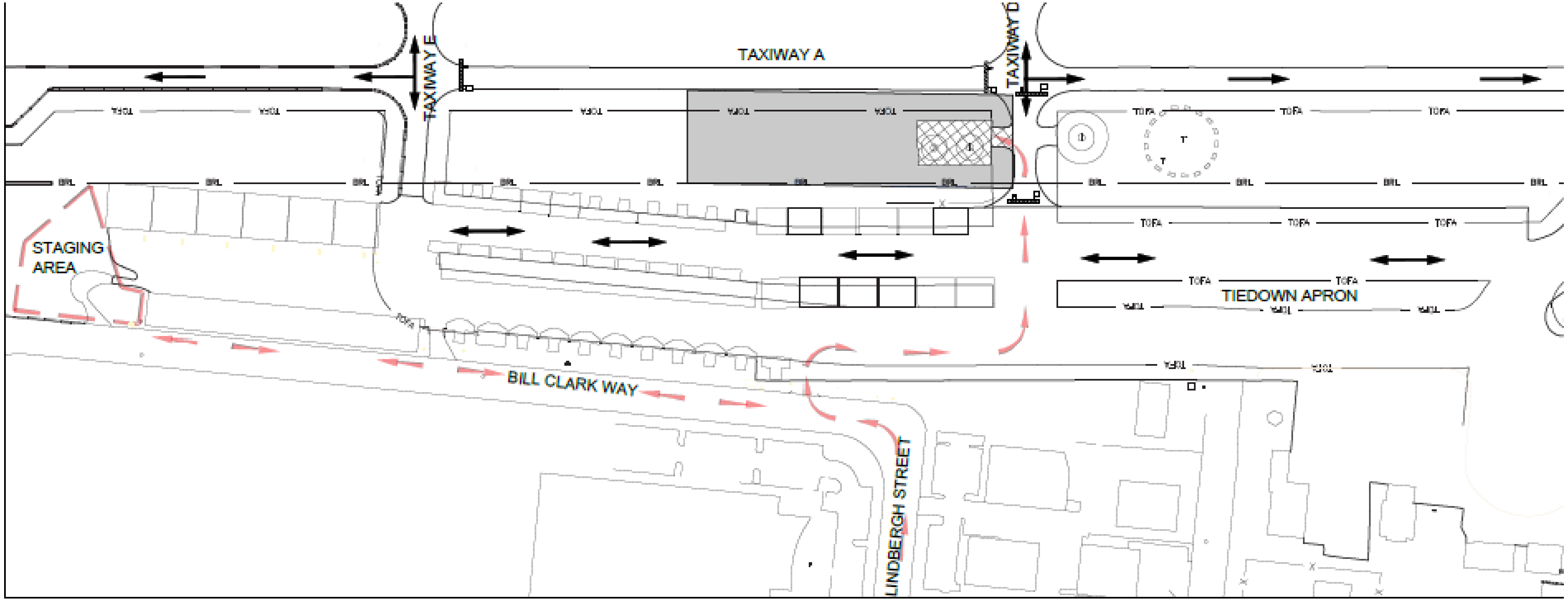


Pavement Design and Geometrics



- AC No: 150/5390-2C Heliport Design
- AC No: 150/5320-6F Airport Pavement Design and Evaluation

Construction Phasing Concept



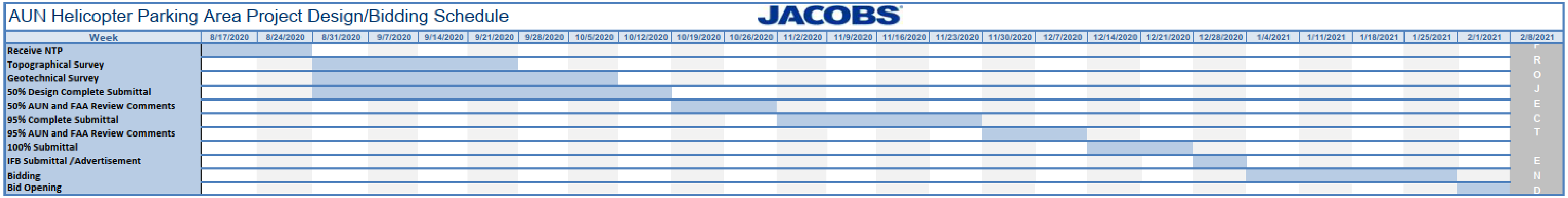
CONSTRUCTION PHASING NOTES				
SCHEDULE I				
PHASE	SCOPE OF WORK	DURATION	AREA (SY)	COMMENTS
1A	• EXISTING PARKING AREA DEMOLITION • CONSTRUCTION OF NEW PARKING AREA • PERMANENT STRIPING	XX WORKING DAYS	XX	• TAXIWAY A AND D ENTRANCE WILL BE CLOSED DURING THIS PHASE.

NOTES:
1. CONTRACTOR TO COORDINATE TEMPORARY HELICOPTER PARKING WITH THE AIRPORT.
2. FLAGGER NEEDED AT TAXIWAY D.

- Plan to be updated to coordinate with CSPP

Jacobs
Challenging today.
Reinventing tomorrow.

Project Deliverables and Schedule



DESIGN MILESTONES	CALENDAR DAYS	ANTICIPATED DATE
Kick-off Meeting		**September 16, 2020**
50% Design Submittal	30 days after kick off meeting	**October 16, 2020**
AUN/FAA Review Period	14 days after receiving submittal	**October 30, 2020**
95% Design Submittal	26 days after review	**November 25, 2020**
AUN/FAA Review Period	14 days after 95% Submittal	**December 9, 2020**
100% Submittal	14 days after review	**December 23, 2020**
IFB Submittal	7 days after 100% Submittal	**December 30, 2020**
Start Bidding Advertisement	7 days after IFB	**January 06 2021**
Bid Opening	30 days after advertise	**February 5, 2021**

Jacobs Challenging today. Reinventing tomorrow.

Field Investigation Activities

- Survey - PSOMAS
  - Start – Week of 9/14/20
  - Deliverable – 9/25/20

- Geotechnical Investigation – NV5
  - Start – Week of 9/14/20
  - Deliverable – 10/9/20

DBE PLAN AND GOALS

- 3-year Overall DBE Goals
- Plan Update Required - FY 2020 and 2021 to get back on cycle.
- Reporting December 1, annually
- No ACDBE Required for AUN

THANK YOU

QUESTIONS?

September 14, 2020

Challenging today.
Reinventing tomorrow.

Auburn Municipal Airport (AUN) - Helicopter Parking Apron

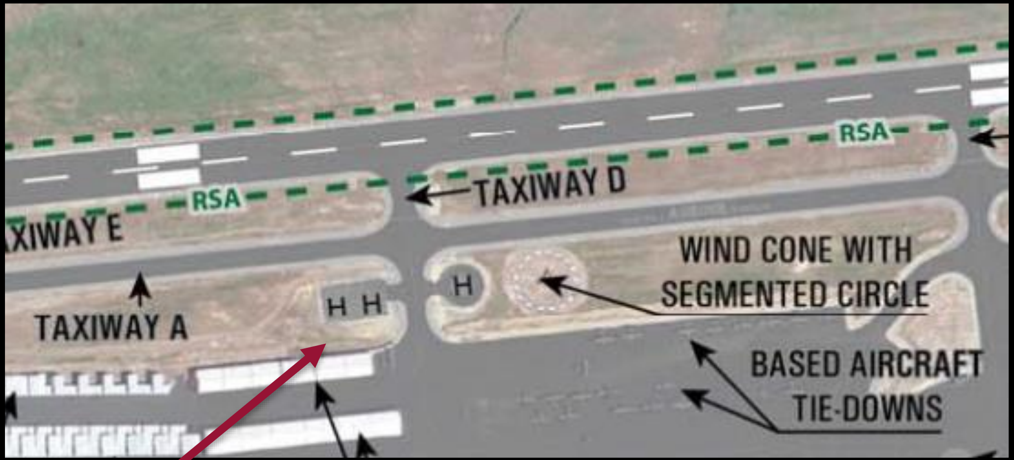
Stakeholder Outreach Meeting

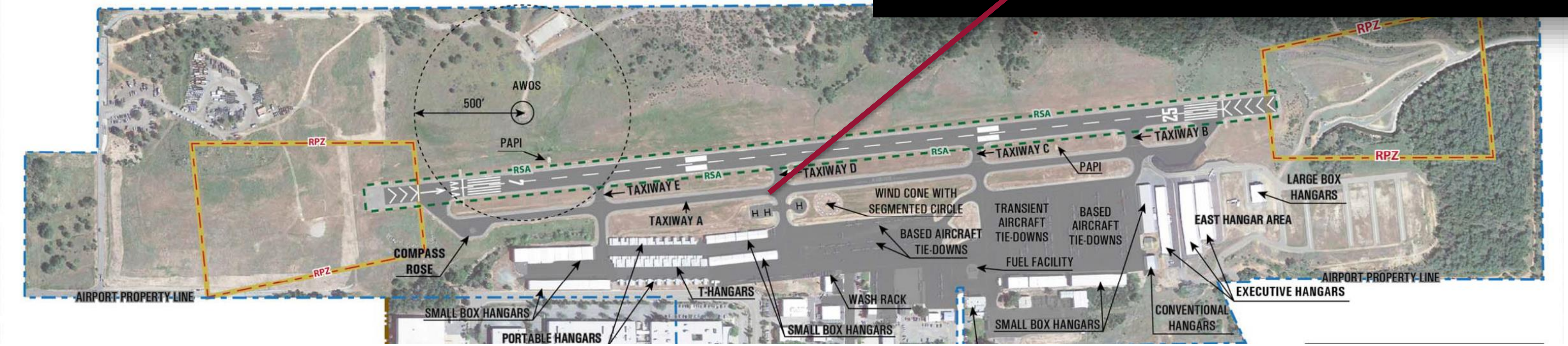
September 22, 2020

Challenging today.
Reinventing tomorrow.

Project Location

- The ALP Narrative identified several potential helicopter parking sites.
- The preferred alternative was to increase the helicopter parking at the existing location.





Jacobs Challenging today. Reinventing tomorrow.

Existing Site Conditions

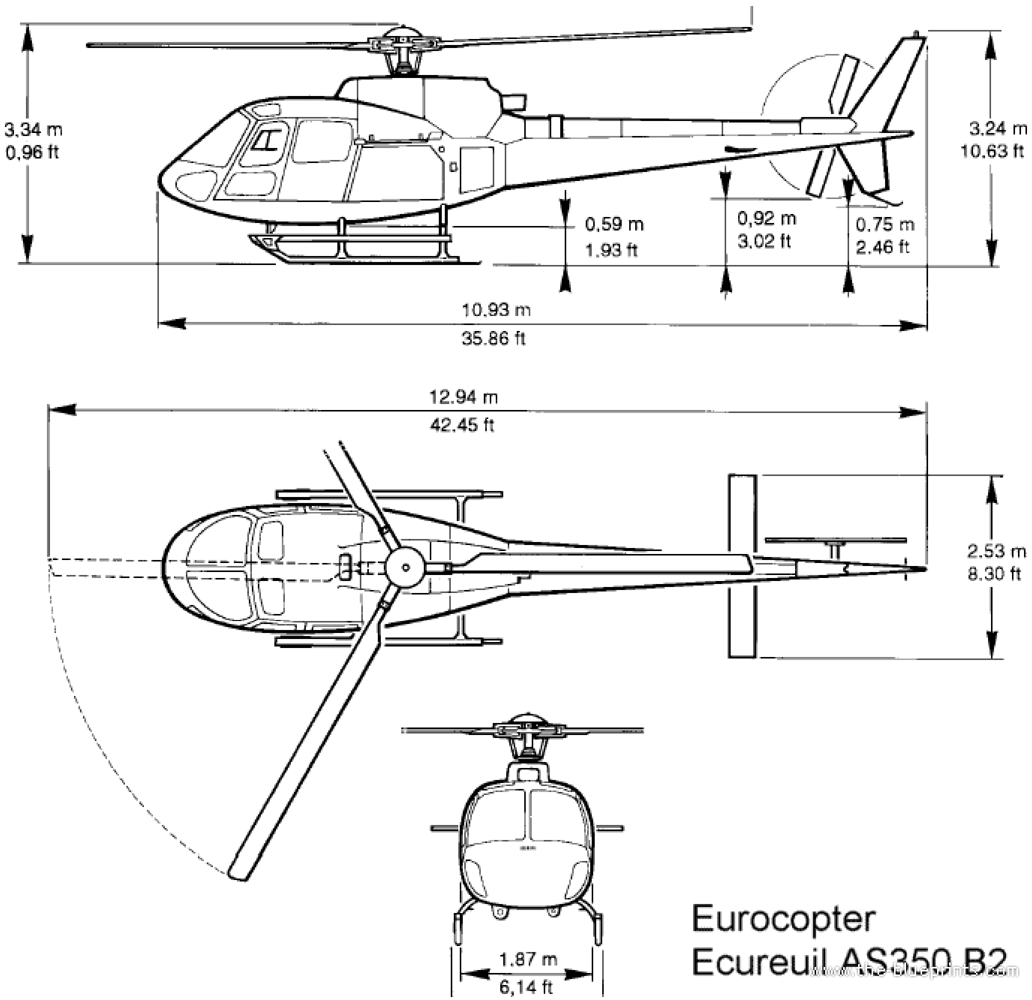
- Current helicopter parking area is located between the apron and Taxiway “A” along Taxiway “D”.

- Two existing helicopter parking areas are located west of Taxiway “D” and a single helicopter parking area east of Taxiway “D”.

- Existing pavement is deteriorated and requires reconstruction.

Jacobs Challenging today. Reinventing tomorrow.

Design Helicopter

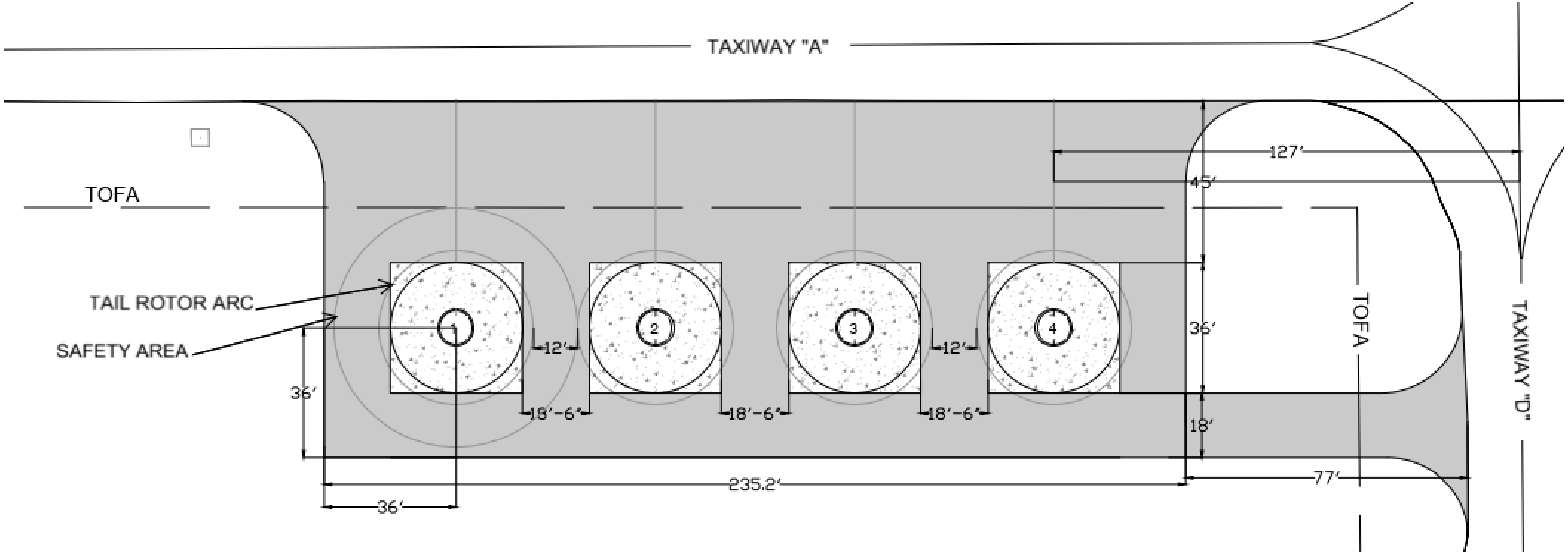


Eurocopter AS350

- Rotor Diameter (RD): 35’ 1”
- Undercarriage Length (D): 35’ 10”
- Tail Rotor Arc: 42’ 6”
- Max Takeoff Weight: 4,960 lb

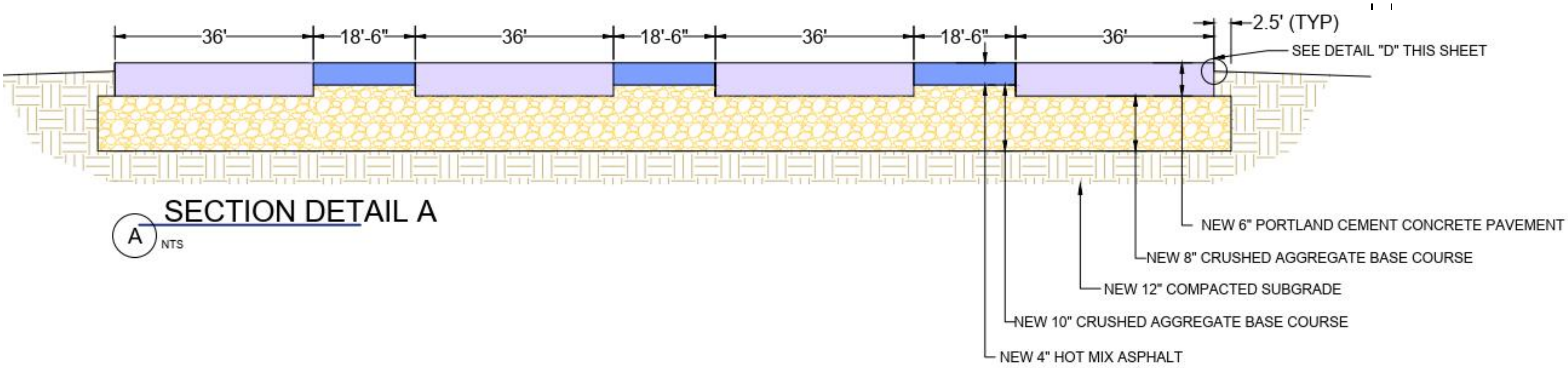
Pavement Design and Geometrics

- This project is <u>not</u> considered a “Heliport” or “Helipad”.
- Geometric layout is based on helicopters utilizing existing Runway and Taxiways take-off and landing
- Proposed Layout provides four (4) new helicopter parking areas
- Minimizes apron area by allowing direct access to Taxiway “A”
- Access road for fueling.



Jacobs Challenging today. Reinventing tomorrow.

Pavement Design and Geometrics

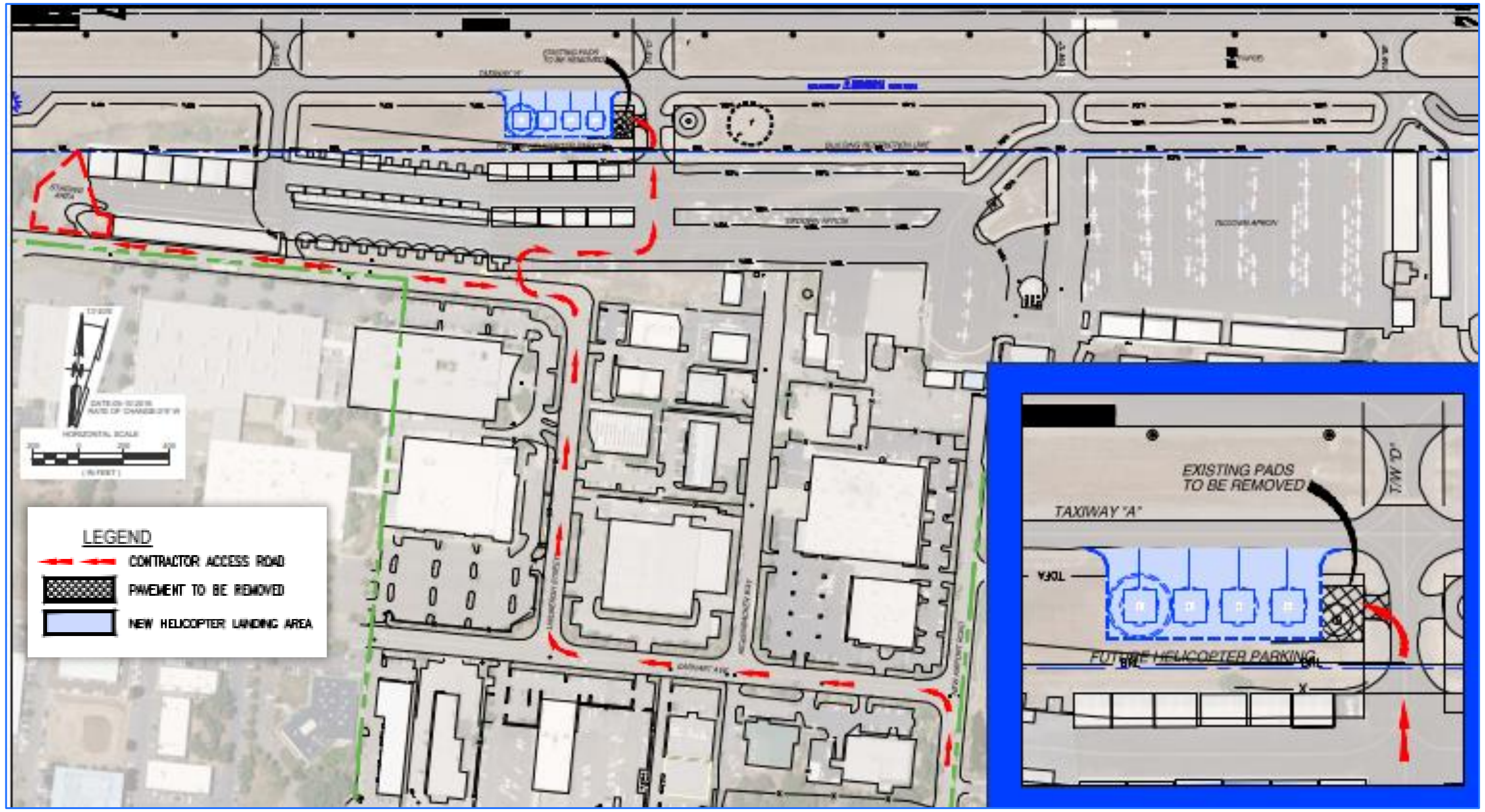


- Design Criteria Utilized
  - AC No: 150/5390-2C Heliport Design
  - AC No: 150/5320-6F Airport Pavement Design and Evaluation
  - AC No: 150/5300-13A Airport Design
- Cost/Benefit is maximized by utilizing concrete and asphalt pavements
- Aggregate Base material provides stabile base.

Jacobs Challenging today. Reinventing tomorrow.

Project Haul Route

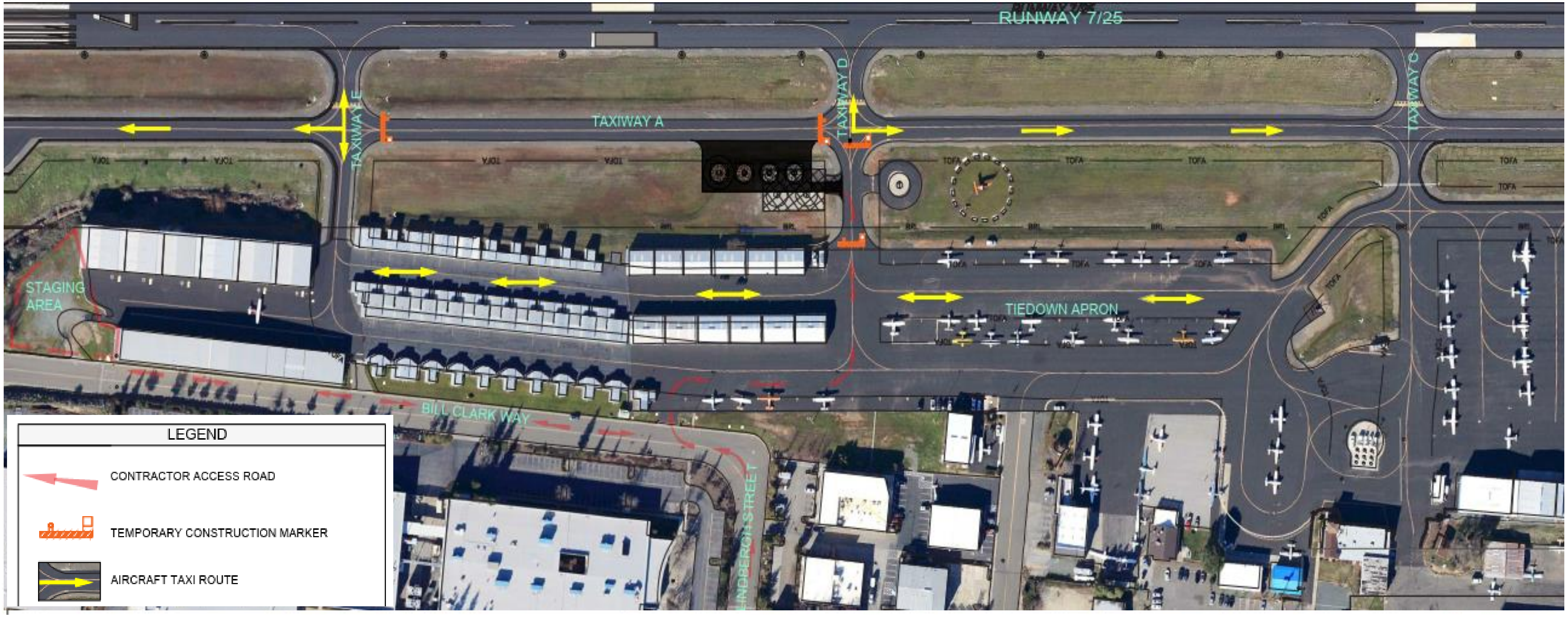
- Anticipated haul route will be accessed from Bell Rd.
  - North on New Airport Rd.
  - West on Earhart Ave.
  - North on Lindbergh St.
  - West on Bill Clark Way
- A vacuum truck will be required to maintain apron access clear of debris.



Jacobs Challenging today. Reinventing tomorrow.

Construction Phasing Concept

- Operational impacts will be minimal to taxiing aircraft.
- Taxiway “A” will be closed between Taxiway “D” and Taxiway “E”.
- Taxiway “D” will be closed between apron and Taxiway “A”
- Temporary helicopter parking will be available on the existing apron; location TBD.



Jacobs Challenging today. Reinventing tomorrow.

Project Deliverables and Schedule

DESIGN MILESTONES	CALENDAR DAYS	ANTICIPATED DATE
Kick-off Meeting		**September 16, 2020**
50% Design Submittal	82 days after kick off meeting	**December 7, 2020**
AUN/FAA Review Period	14 days after receiving submittal	**December 21, 2020**
95% Design Submittal	35 days after review	**January 25, 2021**
AUN/FAA Review Period	14 days after 95% Submittal	**February 8, 2021**
100% Submittal	14 days after review	**February 22, 2021**
IFB Submittal	7 days after 100% Submittal	**March 1, 2021**
Start Bidding Advertisement	7 days after IFB	**March 8, 2021**
Bid Opening	30 days after advertising	**April 7, 2021**

THANK YOU

QUESTIONS?

Challenging today.
Reinventing tomorrow.

APPENDIX B

Geotechnical Report

THIS PAGE INTENTIONALLY LEFT BLANK

GEOTECHNICAL ENGINEERING REPORT

AUBURN MUNICIPAL AIRPORT – NEW HELICOPTER PARKING AREA

APN 052-010-028-000
AUBURN, PLACER COUNTY, CALIFORNIA

NOVEMBER 13, 2020

PREPARED FOR:

JACOBS ENGINEERING GROUP INC
707 17TH STREET, SUITE 2400
DENVER, COLORADO 80202

NV5

792 SEARLS AVENUE
NEVADA CITY, CA 95959

PROJECT NO. 4455.00.01

Project No. 3783A.00
November 13, 2020

Jacobs Engineering Group Inc
707 17th Street, Suite 2400
Denver, Colorado 80202-5131

Attention: Jesus Moncada, PE, Senior Project Manager

Reference: Auburn Municipal Airport – New Helicopter Parking Area
APN 052-010-028-000
Auburn, Placer County, California

Subject: Geotechnical Engineering Report

Dear Mr. Moncada:

This report presents the results of our geotechnical engineering investigation for the proposed helicopter parking area to be constructed at the Auburn Municipal Airport (AUN) in Auburn, California. As proposed, the project is likely to include construction of a new helicopter parking area, comprised of four helipads, and access roadway located southwest of Taxiways "A" and "D."

The findings presented in this report are based on our subsurface investigation, laboratory test results, and our experience with subsurface conditions in the area. Our opinion is that the project can be completed as proposed, provided the recommendations presented in this report are implemented. Our primary concern, from a geotechnical engineering standpoint, includes the presence of shallow potentially expansive soil. Recommendations for mitigating potentially expansive soil are presented in the report.

Please contact us if you have any questions regarding our observations or the recommendations presented in this report.

Sincerely,

NV5

Prepared by:

Janina S. Smith
Staff Engineer

Reviewed by:

Chuck R. Kull, GE 2359, CEG 1622
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER CHARLES R. KULL No. 2359 GEOTECHNICAL STATE OF CALIFORNIA

REGISTERED GEOLOGIST CHARLES R. KULL No. 1622 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

Sent via U.S. Mail and Email to Jesus.Moncada@jacobs.com

F:\1 Projects\3783 Auburn Airport Helipad\3783A.00\Gtk Report\01 Text\3783A.00_AUN New Helicopter Parking_Geotechnical Report.docx

TABLE OF CONTENTS

ATTACHMENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

At the request of Jacobs Engineering Group Inc (Jacobs), NV5 performed a geotechnical investigation of the proposed helicopter parking area to be constructed at the Auburn Municipal Airport (AUN) in Auburn, California. The project area comprises Placer County assessor parcel number (APN) 052-010-028-00. The subject project area is herein referred to as the “project site.”

The geotechnical investigation was performed in general accordance with our proposal for the project, dated December 31, 2019. For your review, Appendix A contains a document prepared by Geoprofessional Business Association (GBA) entitled Important Information about Your Geotechnical Engineering Report, which summarizes the general limitations, responsibilities, and use of geotechnical reports.

1.1 SITE DESCRIPTION

The project site is located at the Auburn Municipal Airport in Auburn, California, and is located southwest of Taxiways “A” and “D.” The project site is accessed by Rickenbacker Way or New Airport Road. The Auburn Municipal Airport is bordered by undeveloped and residential property to the north, east and west, and by commercial properties to the south and southwest. A site location map is presented as Figure 1.

At the time of our field investigation, the Auburn Municipal Airport was active with airplane and helicopter traffic. The proposed helicopter parking area was comprised of existing helicopter parking (two helipads) to the east and a clear area covered with short grasses to the west. In general, the east and west portions of the project site were transected by a northeast to southwest trending moderate grade slope approximately 3 feet in height. Figure 2 shows approximate locations of the existing helicopter parking, hangars, and taxiways, as well as an outline of the proposed helicopter parking area.

1.2 PROPOSED IMPROVEMENTS

Based on conversations with Jacobs and review of a preliminary site plan, we understand that the proposed improvements will likely include construction of a new helicopter parking area, comprising four helipads, and access roadway located southwest of taxiways “A” and “D.” Appurtenant construction will likely include a drainage swale between taxiway “A” and the proposed helicopter parking area, with a culvert constructed under the proposed access roadway. We anticipate that grading for the project will include fill for raising grade in the western portion of the parking area and access roadway.

1.3 PURPOSE

We performed a surface reconnaissance and subsurface geotechnical investigation at the project site, collected soil samples for laboratory testing, and performed engineering calculations to provide grading and pavement recommendations for the proposed improvements.

1.4 SCOPE OF SERVICES

To prepare this report, we performed the following scope of services:

- We performed a site investigation, including a literature review and field investigation.
- We collected relatively undisturbed soil samples and bulk soil samples from selected exploratory borings.
- We performed laboratory tests on select soil samples obtained during our field investigation to determine their engineering material properties.
- Based on observations made during our field investigation and the results of laboratory testing, we performed engineering calculations to provide geotechnical engineering recommendations for earthwork and pavement improvements.

Our scope of services did not include a groundwater flow analysis, nor an evaluation of the project site for the presence of hazardous materials, historic mining features, asbestiform minerals, or mold.

2.0 SITE INVESTIGATION

We performed a site investigation to characterize the existing surface conditions and shallow subsurface soil/rock conditions. Our site investigation included a literature review and field investigation as described below.

2.1 LITERATURE REVIEW

We performed a limited review of geologic literature pertaining to the project site. The following sections summarize our findings.

2.1.1 Soil Survey

As part of our study, we reviewed the Web Soil Survey (United States Department of Agriculture [USDA] Natural Resource Conservation Service [NRCS]; *https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx*). The soil survey indicates that the project site is located in an area containing Auburn-Argonaut complex, 2 to 5 percent slopes. The soil survey describes the Auburn and Argonaut soil types as well drained soils. The Auburn soil is shallow and formed in residuum from vertically tilted basic schist and slate. The Argonaut soil is moderately deep and formed in residuum from metabasic rock.

A typical profile of the Auburn soil type is described as a surface layer of strong brown to yellowish red silt loam to a depth of 20 inches below the ground surface (bgs), underlain by partly weathered basic schist.

A typical profile of the Argonaut soil type is described as a surface layer of strong brown loam to a depth of 4 inches bgs. The loam is typically underlain by yellowish red silt loam to a depth of 9 inches bgs. The silt loam is typically underlain by yellowish red clay loam to a depth of 16 inches bgs. A yellowish brown with patches of yellowish red clay is generally observed below the clay loam, to a depth of 25 inches bgs. Weathered basic schist typically underlies the clay.

2.1.2 Geologic Setting

According to the Mineral Land Classification of Placer County, Department of Conservation, Division of Mines and Geology, DMG Open File Report 95-10 (1995), the project site is generally located in an area mapped as Mesozoic and Paleozoic serpentinized ultramafic rock. The Mesozoic and Paleozoic eras span the time from 540 to 65 million years before present (MYBP).

The referenced geologic map indicates that the project site is likely underlain by serpentinized ultramafic rock, often associated with naturally occurring asbestos (NOA). During our site investigation, we encounter serpentinized ultramafic rock in our borings. If ultramafic rock, serpentinite or NOA-containing minerals are encountered during grading activities, site grading would be regulated under Cal/EPA Air Resources Board Regulation 93105, Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (ATCM) and Placer County Rule 228, Fugitive Dust. We anticipate that, as a minimum, dust mitigation measures such as limiting site access, restricting onsite construction vehicle speeds, covering stockpiled soil, and liberal use of water during grading will be required during grading to prevent the generation of dust from the project site. We can prepare an asbestos dust mitigation plan (ADMP), if required, for project planning and approval purposes.

We reviewed California Geological Survey Open File Report 96-08, *Probabilistic Seismic Hazard Assessment for the State of California*, and the 2002 update entitled *California Fault Parameters*. The documents indicate the project site is located within the Foothills Fault System. The Foothills Fault System is designated as a Type C fault zone, with low seismicity and a low rate of recurrence. The 1997 edition of California Geological Survey Special Publication 42, Fault Rupture Hazard Zones in California, describes active faults and fault zones (activity within 11,000 years), as part of the Alquist-Priolo Earthquake Fault Zoning Act. The map and document indicate the project site is not located within an Alquist-Priolo active fault zone.

2.2 FIELD INVESTIGATION

We performed our field investigation on April 22, 2020. During our field investigation, we observed the local topography and surface conditions and performed a subsurface investigation. The following sections summarize surface and subsurface conditions observed during our field investigation.

Our subsurface investigation included the excavation of 5 exploratory borings across the project site. We excavated to depths ranging between 5.5 and 15.75 feet below the ground surface (bgs) using a CME 75 drill rig equipped with 3.25-inch hollow stem augers and a 140 pound automatic hammer. After sampling, borings B2 through B5 were backfilled with drill cuttings, and boring B1 was backfilled with drill cuttings and covered with an asphalt patch. A staff engineer from our firm logged the soil conditions revealed in the exploratory borings and collected relatively undisturbed and bulk soil samples for laboratory testing. Figure 2 shows the approximate exploratory boring locations, and were determined approximately by pacing their distance from features onsite and should be considered accurate only to the degree implied by the method used.

2.2.1 Surface Conditions

At the time of our field investigation, the proposed helicopter parking area consisted of existing helicopter parking (two helipads) to the east and a clear area covered with short grasses to the west. The proposed helicopter parking area was bordered by taxiway “A” to the north, taxiway “D” to the east, hangars to the south, and a clear grassy area to the west. A drainage swale was observed between the existing helicopter parking area and taxiway “A” (to the north). The existing helicopter parking, taxiways, and hanger areas were covered with asphaltic concrete (AC) pavement.

Site topography in the area of the proposed helicopter parking area was generally flat, except for an approximately 3-foot high, moderate slope, transecting the project site from northeast to southwest, and a gentle graded slope located along the southern project site boundary (north of the existing hangers). According to Google Earth, site topography from east to west across the project site generally trends from approximately 1497 to 1490 feet above mean sea level (AMSL).

2.2.2 Subsurface Soil Conditions

The following described soil conditions are generalized, based on our interpretation of the subsurface soil, groundwater, and bedrock conditions observations in our 5 exploratory borings.

The relatively consistent soil conditions encountered in our exploratory borings indicate that such conditions are present in the near vicinity of the boring locations. Subsurface conditions may vary at other locations and times. The location of the soil and bedrock boundaries should be considered approximate. The transition between soil and bedrock types may be gradual. More detailed information can be found in the boring logs in Appendix B.

Boring B-1, located at the existing helicopter parking, was advanced through approximately 2 inches of asphalt and 7 inches of aggregate base (AB). The pavement section was underlain by moderately to very strong, completely to moderately weathered, ultramafic rock that excavated as light gray to light yellowish brown sandy silt. Boring B-1 was terminated in weathered rock at 15.5 feet below ground surface (bgs).

Boring B-2 through B-4 were advanced through approximately 0.75 to 1.0 feet of surface soil generally described as reddish brown, stiff to hard, dry, clay with sand. The surface soil was underlain by grayish brown to brown, firm to stiff, dry to damp, fat clay with sand (residual soil) to depths of approximately 1.5 feet bgs. Underlying the residual soil was moderately to very strong, completely to moderately weathered, ultramafic rock that excavated as light gray to light yellowish brown sandy silt. Borings B-2 and B-4 were terminated upon refusal on rock at depths of 5.5 and 2.5 feet bgs, respectively. Boring B-3 was terminated in weathered rock at 15.75 feet bgs.

Boring B5 was advanced through approximately 1.75 feet of surface soil generally described as reddish brown, stiff to hard, dry, clay with sand. The surface soil was underlain by moderately to very strong, completely to moderately weathered ultramafic rock that excavated as light gray to light yellowish brown sandy silt. Borings B-5 was terminated upon refusal on rock at 5.5 feet bgs.

2.2.3 Groundwater Conditions

During our field investigation, we did not encounter groundwater seepage in our exploratory borings, nor did we observe onsite springs or seeps emanating from the ground surface. Our observations of groundwater conditions were made in October 2020 following a period of relatively dry weather. Although we did not observe groundwater in our exploratory borings, our experience has shown that seepage may be encountered in excavations which reveal the soil/weathered rock transition, particularly during or after the rainy season.

3.0 LABORATORY TESTING

We performed laboratory tests on selected soil samples collected from our subsurface exploratory borings to determine their engineering material properties. These engineering material properties were used to develop geotechnical engineering design recommendations for earthwork and pavement improvements. We performed the following laboratory tests:

- Atterberg Limits (ASTM D4318)
- Resistance Value (D2844)
- Minimum Soil Resistivity (Caltrans Method 643)
- Sulfate and Chloride (Caltrans Method 417 and 422M)

In general, relatively undisturbed soil samples were collected for laboratory testing within the upper 5 feet of the borings. Appendix D presents laboratory test data.

We performed an Atterberg limits determination on a sample collected at approximately 1.0 feet bgs from boring B-4 (B4-L1). The Atterberg limits determination revealed that the portion of the sample passing the No. 40 sieve had a liquid limit of 74 and a plastic limit of 22, resulting in a plasticity index of 52. Based on the Atterberg limits determination, we classified the soil as a clay with high plasticity (CH).

We were unable to performed expansion index testing on sample B4-L1 or additional samples of the same clayey soil due to low sample recovery. Based on the Atterberg limits determination we classified the soil as a fat clay (CH) with high plasticity.

One R-value test was performed on a composite bulk sample obtained from Borings B-1 and B-2 from 1.0 to 5.0 feet bgs. The test indicated that the predominantly fine-grained soil had an R-value of 14, by exudation pressure. Based on our experience in the area and the subsurface conditions revealed during our investigation, we elected to use a design R-value of 12. Selective grading during construction could be performed to place more granular material in the upper 18-24 inches of subgrade to increase durability and reduce baserock sections.

A soil sample was collected from Boring B-3 at 2.0 feet bgs for corrosion testing. Corrosion testing, including pH, minimum resistivity, sulfate content and chloride content, was performed by Sunland Analytical in accordance with CA DOT test methods 643, 417, and 422m. Table 3.0-1 summarizes the test results. Based on the limited tests, the soil is moderately corrosive to buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron. Test results are discussed further in section 5.1.9, “Soil Corrosion Potential.” The laboratory report is included in Appendix C.

Table 3.0-1: Summary of Corrosion Testing

Boring/ Sample Number	Sample Depth (feet)	pH	Minimum Resistivity (ohms-cm)	Chloride Content (ppm)	Sulfide Content (ppm)
B-3 / B3-BK1	2.0	6.26	1,450	2.3	5.1
Notes: Ohms-cm = ohms centimeter ppm = parts per million					

4.0 CONCLUSIONS

The following conclusions are based on our field observations, laboratory test results, and our experience in the area.

1. Our opinion is that the project site is suitable for the proposed improvements, provided that the geotechnical engineering recommendations and design criteria presented in this report are incorporated into the project plans.

2. Based on our site observations, the geology of the region, and our experience in the area, our opinion is that the risk of seismically induced hazards such as slope instability, liquefaction, and surface rupture are remote at the project site.

3. Based on the site geology and our observation of the surface conditions, we anticipate that grading and excavation onsite will reveal variably weathered, fractured, ultramafic rock. Areas of resistant rock may be encountered which may require splitting or hammering to increase the rate of excavation.

4. We did not encounter existing fill in our exploratory borings. If existing fill is encountered during construction, we should be retained to evaluate the condition of the fill, and to make recommendations to mitigate the presence of fill, if necessary. Existing fill, if encountered, should not be relied upon to support proposed improvements without testing and evaluation.

5. Fat Clay was encountered at shallow depths in our exploratory borings. Expansive near-surface soils shrink and swell as they lose and gain moisture throughout the yearly weather cycle. Near the surface, the resulting movements can heave and crack lightly loaded slabs and pavements. Recommendations regarding fine grained, potentially expansive soils are presented in this report.

6. During our site investigation, we did encounter serpentinized ultramafic rock. Furthermore, the referenced geologic map indicates that portions of the project site are likely underlain by serpentinite, a rock often associated with naturally occurring asbestos (NOA). If ultramafic rock, serpentinite or NOA-containing minerals are encountered at the project site, site grading would be regulated under Cal/EPA Air Resources Board Regulation 93105, Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (ATCM). We anticipate that, as a minimum, dust mitigation measures such as limiting site access, restricting onsite construction vehicle speeds, covering stockpiled soil, and liberal use of water during grading will be required during grading to prevent the generation of dust from the project site. We can prepare an asbestos dust mitigation plan (ADMP), if required, for project planning and approval purposes.

7. Although we did not observe shallow groundwater or seepage during our field investigation, areas of seepage may be encountered during grading onsite, particularly during the rainy season and/or in excavations which reveal the surface soil/weathered rock contact. Preliminary recommendations regarding construction dewatering are presented in this report.
8. Prior to grading and construction, we should be retained to review the proposed grading plan to confirm our recommendations.

5.0 RECOMMENDATIONS

The following geotechnical engineering recommendations are based on our understanding of the project as currently proposed, our field observations, the results of our laboratory testing program, engineering analysis, and our experience in the area.

5.1 GRADING

The following sections present our grading recommendations. The grading recommendations address clearing and grubbing, expansive soil, soil preparation for fill placement, engineered fill, fill slope grading, erosion control, surface water and subsurface drainage, soil corrosion potential, plan review, and construction monitoring.

5.1.1 Clearing and Grubbing

Areas proposed for fill placement, roadway, and parking area construction should be cleared and grubbed to remove vegetation, weak and porous soils, and other deleterious materials as described below. We anticipate that clearing and grubbing will be minimal at the project site.

1. Strip and remove debris from clearing operations and the weak and porous soil containing shallow vegetation, roots and other deleterious materials. We anticipate that the depth of grubbing and clearing would be between 1 and 3 inches, but the actual depth of stripping will vary across the project site. The organic topsoil can be stockpiled onsite and used in landscape areas but is not suitable for use as engineered fill. The project geotechnical engineer should approve any proposed use of the spoil generated from stripping prior to placement on the project site.
2. Overexcavate any relatively loose debris and soil that is encountered in our exploratory borings or any other onsite excavations to underlying, competent material. Possible excavations include exploratory trenches excavated by others, mantles or soil test pits, and holes resulting from tree stump or boulder removal.
3. If loose, untested fill is encountered during site development, overexcavate to competent native soil or weathered rock and replace with engineered fill in accordance with Sections 5.1.3, “Soil Preparation for Fill Placement,” and 5.1.4, “Engineered Fill,” of this report.
4. Fat clay was encountered in our exploratory borings between depths of 0.75 and 1.5 feet bgs. Fine grained, potentially expansive soil, as determined by NV5, that is encountered during grading should be overexcavated and stockpiled for removal, mixed as directed by NV5, or used in landscape areas. Recommendations for mitigating potentially expansive soil is presented in Section 5.1.2, “Expansive Soil,” of this report.

5. All rocks greater than 8 inches in greatest dimension (oversized rock) should be removed from the top 12 inches of native soil, if encountered. Oversized rock may be used in landscape areas, rock landscape walls, rock faced slopes, or removed from the project site.
6. Vegetation, deleterious materials, pavement debris, and oversized rocks not used in landscape areas, drainage channels, or other non-structural uses should be removed from the project site.

5.1.2 Expansive Soil

Based on the results of our field investigation and laboratory testing, fine-grained potentially expansive soil is present on the project site. Expansive soil is characterized by its ability to undergo significant volume change (shrink/swell) due to fluctuations in moisture content. Changes in soil moisture content can result from rainfall, landscape irrigation, perched groundwater, drought, or other factors and may cause unacceptable settlement or heave of structures, concrete slabs-on-grade, or pavements supported over these materials.

Expansive soil is typically identified by the presence of smaller clay minerals. Soil properties with the potential for swelling include a plasticity index (PI) greater than 15 and an Elastic Index (EI) greater than 20.

Expansive soil, where encountered, should be over-excavated to underlying competent native soil or weathered rock, or a minimum depth of 2 feet below slabs-on-grade and pavement sections. Over-excavations should extend a minimum 2 feet laterally from the edge of hardscapes. Over-excavations should be backfilled with approved non-expansive soil, placed and compacted in accordance with the following grading recommendations. Excavated expansive soil(s) should either be disposed off-site, placed in non-structural areas, or placed within the lower portion of deep fills.

It may be possible to mix potentially expansive soil with granular soil in order to reuse the material as structural fill. The actual mix ratio should be evaluated by NV5 at the time of construction, but a typical mix ratio for this type of application is about 4 parts granular soil to 1 part expansive soil. We recommend that an NV5 representative be present during site grading and earthwork to evaluate the implementation of our recommendations and provide additional or revised recommendations, if needed.

5.1.3 Soil Preparation for Fill Placement

Where fill placement is proposed, the surface soil exposed by site clearing and grubbing should be prepared as described below.

1. The surface soil should be scarified to a minimum depth of 12 inches below the existing ground surface, or to resistant rock, whichever is shallower. Following scarification, the soil should be uniformly moisture conditioned to within approximately 3 percentage points of the ASTM D1557 optimum moisture content.
2. The scarified and moisture conditioned soil should then be compacted to achieve a minimum relative compaction of 90 percent based on ASTM D1557 maximum dry density. The moisture content, density, and relative percent compaction should be verified by a representative of NV5. The earthwork contractor should assist our representative by excavating test pads with onsite earth moving equipment.

3. The native soil surface should be graded to minimize ponding of water and to drain surface water away from the proposed helicopter parking area. Where possible, surface water should be collected, conveyed and discharged into natural drainage courses or drainage swells.

5.1.4 Engineered Fill

All fill placed beneath pavement and as part of fill slopes should be considered structural engineered fill. Soil fill placement proposed for the project should incorporate the following recommendations:

1. Soil used to construct engineered fills should be non-expansive, free of deleterious, and consist predominantly of materials less than ½-inch in greatest dimension and should not contain rocks greater than 3 inches in greatest dimension (oversized material). Soil should have a plasticity index (PI) of less than or equal to 15, as determined by ASTM D4318 Atterberg Indices testing. If encountered, rock used in fill should be broken into pieces no larger than 3 inches in diameter. Rocks larger than 3 inches are considered oversized material and should be stockpiled for offhaul or later use in landscape areas and drainage channels. The contractor could use a rock rake or screen to remove oversized rocks.
2. Import soil should be predominantly granular, non-expansive and free of deleterious material. In general, the import soil should have a plasticity index less than 15 with 100% passing a 3-inch screen and less than 15% passing a No. 200 sieve. Prior to importation to the project site, the source generator should document that the import fill meets the guidelines set forth by the California Regional Water Quality Control Board and/or California Environmental Protection Agency (CalEPA) Department of Toxic Substances Control (DTSC) “Information Advisory, Clean Imported Fill Material” (2001). This advisory represents the best practice for characterization of soil prior to import for use as engineered fill. The Contractor should understand that they are responsible for importing soil that meets the regulatory guidelines. Import material that is proposed for use onsite should be submitted to NV5 for approval and possible laboratory testing at least 72 hours prior to transport to the site.
3. Engineered soil used to construct fill should be uniformly moisture conditioned to within approximately 3 percentage points of the ASTM D1557 optimum moisture content. Wet soil may need to be air dried or mixed with drier material to facilitate placement and compaction, particularly during or following the wet season.
4. Fill should be constructed by placing uniformly moisture conditioned soil in maximum 8-inch-thick loose, horizontal lifts (layers) prior to compacting.
5. All fill should be compacted to a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. The upper 12 inches of fill in paved areas or proposed slabs-on-grade should be compacted to a minimum of 95 percent relative compaction.
6. The earthwork contractor should compact each loose soil lift with a tamping foot compactor such as a Caterpillar (CAT) 815 Compactor or equivalent as approved by NV5’s project engineer or his/her field representative. A smooth steel drum roller compactor should not be used to compact loose soil lifts for construction of engineered fills.

7. The prepared finished grade or finished subgrade soil surface should be proof-rolled with a fully loaded, 4,000-gallon-capacity water truck with the rear of the truck supported on a double-axle, tandem-wheel undercarriage or approved equivalent. The proof-rolled surface should be visually observed by the project engineer or his/her field representative to be firm, competent and relatively unyielding.

5.1.5 Fill Slope Grading

Based on our understanding of the project, we anticipate that fill slopes will be created as part of the proposed development. In general, permanent fill slopes should be no steeper than 2:1 (H:V).

The fill must be benched into existing side slopes as fill placement progresses. Benching must extend through loose surface soil into firm material, and at intervals such that no loose surface soil is beneath the fill. As a minimum, a horizontal bench should be excavated every 5 vertical feet or as determined by a representative of NV5.

Fill should be placed in horizontal lifts to the lines and grades shown on project plans. Fill slopes should not be constructed or extended horizontally by placing soil on an existing slope face and/or compacted by track walking.

Slopes should be constructed by overbuilding the slope face and then cutting it back to the design slope gradient and grade.

5.1.6 Erosion Controls

Graded portions of the project site should be seeded as soon as possible to allow vegetation to become established prior to and during the rainy season. In addition, grading that results in greater than one acre of soil disturbance or in sensitive areas may require the preparation of a site-specific stormwater pollution prevention plan. As a minimum, the following controls should be installed prior to and during grading to reduce erosion.

1. Prior to commencement of site work, fiber rolls should be installed down slope of the proposed area of disturbance to reduce migration of sediment from the project site. Fiber rolls on slopes are intended to reduce sediment discharge from disturbed areas, reduce the velocity of water flow, and aid in the overall revegetation of slopes. The fiber rolls should remain in place until construction activity is complete and vegetation becomes established.
2. Erosion controls should be installed on all cut and fill slopes to minimize erosion caused by surface water runoff.
3. All soil exposed in permanent slope faces should be hydroseeded or hand seeded/strawed with an appropriate seed mixture compatible with the soil and climate conditions of the project site as recommended by the local Resource Conservation District. Alternatively, an appropriate manufactured erosion control mat may be applied.
4. Install surface water drainage ditches at the top of cut and fill slopes (as necessary) to intercept and redirect concentrated surface water away from cut and fill slope faces. Under no circumstances should concentrated surface water be directed over slope faces. The intercepted water should be discharged into natural drainage courses or into other collection and disposal structures.

5. If grading is performed during wet weather, exposed soil may be susceptible to excessive disturbance. This could create a situation where previously completed earthwork needs to be repaired, possibly leading to project delays. Sediment and erosion control efforts, particularly stormwater mitigation, should be implemented in accordance with local accepted industry standards and best management practices.

5.1.7 Surface Water Drainage

Final site grading should be planned so that surface water is directed away from all slopes and hardscapes, including pavements, as described below.

1. Slope final grades so that surface water drains away from the proposed helicopter parking area finished subgrade at a minimum 2 percent slope for a minimum distance of 10 feet. Ponding of surface water should not be allowed on or near the edge of pavements.
2. Direct surface water off the helicopter parking area so that concentrated flow over fill areas does not cause erosion.
3. We anticipate that the existing drainage swale located between the existing helicopter parking area and taxiway “A” will need to be extended across the proposed fill. We also anticipate a culvert will be installed beneath the proposed access road, which is to be constructed across the drainage swell.
4. Drainage gradients should be maintained to carry all surface water to a properly designed infiltration facility.

5.1.8 Subsurface Drainage

If grading is performed during or immediately following the rainy season, seepage will likely be encountered. If groundwater or saturated soil conditions are encountered during grading, we anticipate that dewatering may be possible by gravity or by temporary installation of sump pumps in excavations.

Control of subsurface seepage at the base of fill areas can typically be accomplished by placement of an area drain. Underlying, saturated soil is typically removed and replaced with free draining, granular drain rock enveloped in geotextile fabric to an elevation above the encountered groundwater. Fill soil can be placed over the granular rock. NV5 should review proposed drainage improvements with regard to the site conditions prior to construction.

5.1.9 Soil Corrosion Potential

The project site soil corrosion potential was evaluated by Sunland Analytical on a soil sample collected at a depth of approximately 2.0 feet bgs from Boring B-2. Based on the limited tests (i.e., pH, resistivity, chloride, sulfate, and sulfide) the soil is moderately corrosive to buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron. All buried metallic piping should be protected against corrosion in accordance with the pipe manufacture recommendations. The laboratory report is included in Appendix C.

We reviewed the Online Soil Survey prepared by the USDA Soil Conservation Service (*https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx*). Based on review of soil survey information the native soil conditions onsite possess a low corrosion potential for concrete and a low corrosion potential for uncoated steel. To reduce the likelihood of corrosion problems, materials used for structural improvements should be selected based on local experience and practice. If alternative or new construction methods or materials are being proposed, it may be appropriate to have the selected materials evaluated by a corrosion engineer for compatibility with the onsite soil and groundwater conditions.

5.1.10 Grading Plan Review and Construction Monitoring

Coordination between the design team and the geotechnical engineer is recommended to assure that the design is compatible with the soil, geologic and groundwater conditions encountered during our study. NV5's experience, and that of the engineering profession, clearly indicates that during the construction phase of a project the risks of costly design, construction and maintenance problems can be significantly reduced by retaining a design geotechnical engineering firm to review the project plans and specifications and to provide geotechnical engineering consultation, observation and CQA testing services during construction. Construction quality assurance includes review of plans and specifications and performing construction monitoring as described below.

1. NV5 should be allowed to review the final earthwork grading improvement plans prior to commencement of construction to determine whether the recommendations have been implemented and, if necessary, to provide additional and/or modified recommendations.
2. Prior to commencing a new phase of construction, a meeting should be held at the site that includes, but is not limited to, the owner or owner's representative, the general contractor, the grading contractor, the foundation contractor, the underground contractor, any specialty contractors, the project civil engineer, other members of the project design team and NV5. This meeting should serve as a time to discuss and answer questions regarding the recommendations presented herein and to establish the coordination procedure between the contractors and NV5
3. Prior to commencement of a new phases of development on the site, NV5 should be retained to observe the soil/rock conditions within and surrounding the proposed improvements to confirm or modify our recommendations. A preconstruction meeting with the contractor and subcontractors involved should be held to discuss and review the applicable recommendations of this report as they apply to the proposed construction.
4. NV5 should be retained to perform construction quality assurance (CQA) monitoring of all earthwork grading performed by the contractor to determine whether our recommendations have been implemented, and if necessary, provide additional and/or modified recommendations. Upon your request we will prepare a CQA geotechnical engineering services proposal that will present a work scope, a tentative schedule and a fee estimate for your consideration and authorization. If NV5 is not retained to provide geotechnical engineering CQA services during the construction phase of the Project, then NV5 will not be responsible for geotechnical engineering CQA services provided by others nor any aspect of the Project that fails to meet your or a third party's expectations in the future.

5.2 STRUCTURAL IMPROVEMENT DESIGN CRITERIA

Our opinion is that the proposed helicopter parking area can be constructed of either asphaltic concrete (AC) or Portland cement concrete (PCC). PCC may perform better if the pad will be subjected to fuel trucks or heavy vehicles that may make short radius turns. PCC will be less susceptible to degradation from fuel spills.

5.2.1 Concrete Slab-on-Grade

Concrete slab-on-grade components are described below. If loads higher than 350 psf or intermittent live loads are anticipated, then a California-licensed structural engineer should design the necessary concrete slab-on-grade thickness and steel reinforcements.

1. Minimum 6-Inch-Thick Concrete Slab: The concrete slab should be installed with a minimum 3,000 pounds per square inch (psi) compressive strength after 28 days of curing. NV5 recommends that the concrete design have a water/cement ratio no greater than 0.45 and should be placed with minimum and maximum slumps of 3 and 5 inches, respectively. Pozzolans or other additives may be added to increase workability. The concrete mix design is the responsibility of the concrete supplier.
2. Steel Reinforcement: Reinforcement should be used to improve the load-carrying capacity, to reduce cracking caused by shrinkage during curing and from both differential and repeated loadings. It should be understood that it is nearly impossible to prevent all cracks from development in concrete slabs; in other words, it should be expected that some cracking will occur in all concrete slabs no matter how well they are reinforced. Concrete slabs that will be subjected to heavy loads should be designed with steel reinforcements by a California-licensed structural engineer.
3. Rebar: As a minimum, use No. 3 rebar (ASTM A615/A 615M-04 Grade 60), tied and placed with minimum 18-inch centers in both directions (perpendicular) and supported on concrete “dobies” to position the rebar in the center of the slab during concrete pouring. "Hooking and pulling" of steel during concrete placement is not recommended.
4. Minimum 4-Inch-Thick Crushed Rock or Class II Aggregate Base Rock Layer: The slab should be underlain by either crushed rock or Class II AB rock. Crushed rock should be mechanically consolidated under the observation of NV5. AB rock layers should be placed and compacted to a minimum of 95 percent of the ASTM D1557 dry density with a moisture content of ± 3 percentage points of the ASTM D1557 optimum moisture content. The crushed rock should be washed to produce a particle size distribution of 100 percent (by dry weight) passing the ¾ inch sieve and 5 percent passing the No. 4 sieve and 0 to 3 percent passing the No. 200 sieve. An alternative rock material would include AB rock meeting the specification of Caltrans Class II AB. Just prior to pouring the concrete slab, the rock layer should be moistened to a saturated surface dry (SSD) condition. This measure will reduce the potential for water to be withdrawn from the bottom of the concrete slab while it is curing and will help minimize the development of shrinkage cracks.

5. Subgrade Soil Preparation: The subgrade soil should be prepared and compacted consistent with the recommendations of Section 5.1. The top 6 inches of the non-expansive soil should be compacted to a minimum of 95 percent of the ASTM D1557 dry density with relatively uniform moisture content within ± 3 percentage points of the ASTM D1557 optimum moisture content. Prior to placing slab rock, subgrade soil must be moisture conditioned to between 75 and 90 percent saturation to a depth of 24 inches. Moisture conditioning should be performed for a minimum of 24 hours prior to concrete placement. Clayey soil may take up to 72 hours to reach this required degree of saturation. If the soil is not moisture conditioned prior to placing concrete, moisture will be wicked out of the concrete, possibly contributing to shrinkage cracks. Additionally, our opinion is that moisture conditioning the soil prior to placing concrete will reduce the likelihood of soil swell or heave following construction at locations where fine grained, potentially expansive soil is encountered. To facilitate slab-on-grade construction, we recommend that the slab subgrade soil be moisture conditioned following rock placement.
6. Crack Control Grooves: Crack control grooves should be installed during placement or saw cuts should be made in accordance with the ACI and Portland Cement Association (PCA) specifications. Generally, NV5 recommends that crack control grooves or saw cuts are installed on 10-foot-centers in both directions (perpendicular).
7. Concrete slabs should be moisture cured for at least seven days after placement. Excessive curling of the slab may occur if moisture conditioning is not performed. This is especially critical for slabs that are cast during the warm summer months.
8. The subgrade soil around the slabs-on-grade should be sloped away from the proposed slab subgrade a minimum of 2 percent for a distance of 10 feet as discussed in the “Surface Water Drainage” section of this report.
9. Field observations of all concrete slab-on-grade surfaces and installed steel reinforcements should be made by an NV5 construction monitor prior to pouring concrete.

These recommendations do not address vapor intrusion through the slab. We should be notified if conditioned space is proposed for the proposed helicopter parking area.

5.2.2 Asphaltic Pavement

The following recommended asphalt concrete flexible pavement sections are based on a design R-value of 12 and traffic indices (TIs) of 5 and 6. This is suitable for occasional fueling trucks, light traffic, and helicopters. Pavement design is presented in Table 5.2.2-1.

Table 5.2.2-1 - Recommended Pavement Sections

Traffic Index: 5 **Design R-Value: 12**	**Pavement Section (inches)**
Caltrans Section 39, Standard Specifications Asphalt Concrete	3.0
Caltrans Section 26, Class 2 Baserock 95% compaction	9.5
Subgrade 95% compaction	12.0
Traffic Index: 6 **Design R-Value: 12**	**Pavement Section (inches)**
Caltrans Section 39, Standard Specifications Asphalt Concrete	3.5
Caltrans Section 26, Class 2 Baserock 95% compaction	12.0
Subgrade 95% compaction	12.0

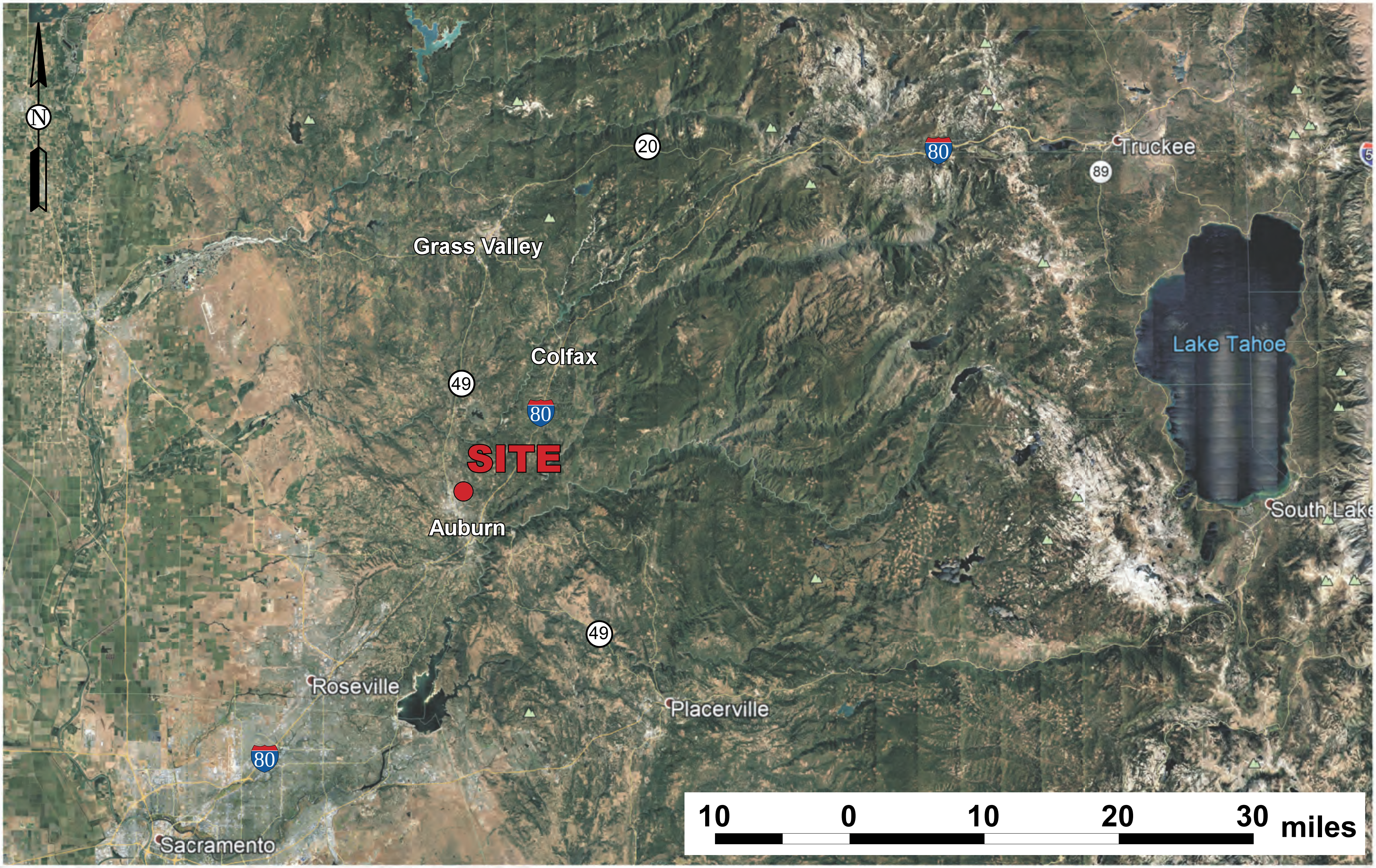
6.0 LIMITATIONS

The following limitations apply to the findings, conclusions and recommendations presented in this report:

1. Our professional services were performed consistent with the generally accepted geotechnical engineering principles and practices employed in northern California. No warranty is expressed or implied.
2. These services were performed consistent with our agreement with our client. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of our services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report. This report is solely for the use of our client unless noted otherwise. Any reliance on this report by a third party is at the party's sole risk.
3. If changes are made to the nature or design of the project as described in this report, then the conclusions and recommendations presented in this report should be considered invalid. Only our firm can determine the validity of the conclusions and recommendations presented in this report. Therefore, we should be retained to review all project changes and prepare written responses with regards to their impacts on our conclusions and recommendations. However, we may require additional fieldwork and laboratory testing to develop any modifications to our recommendations. Costs to review project changes and perform additional fieldwork and laboratory testing necessary to modify our recommendations are beyond the scope of services presented in this report. Any additional work will be performed only after receipt of an approved scope of services, budget, and written authorization to proceed.

4. The analyses, conclusions and recommendations presented in this report are based on site conditions as they existed at the time we performed our surface and subsurface field investigations. We have assumed that the subsurface soil and groundwater conditions encountered at the location of our exploratory trenches are generally representative of the subsurface conditions throughout the entire project site. However, the actual subsurface conditions at locations between and beyond our exploratory borings may differ. Therefore, if the subsurface conditions encountered during construction are different than those described in this report, then we should be notified immediately so that we can review these differences and, if necessary, modify our recommendations.
5. The elevation or depth to groundwater underlying the project site may differ with time and location.
6. The project site map shows approximate boring locations as determined by pacing distances from identifiable site features. Therefore, the trench locations should not be relied upon as being exact nor located with surveying methods.
7. Our geotechnical investigation scope of services did not include evaluating the project site for the presence of hazardous materials. Although we did not observe hazardous materials within the proposed improvement area at the time of our field investigation, all project personnel should be careful and take the necessary precautions should hazardous materials be encountered during construction.
8. The findings of this report are valid as of the present date. However, changes in the conditions of the property can occur with the passage of time. The changes may be due to natural processes or to the works of man, on the project site or adjacent properties. In addition, changes in applicable or appropriate standards can occur, whether they result from legislation or the broadening of knowledge. Therefore, the recommendations presented in this report should not be relied upon after a period of two years from the issue date without our review.

FIGURES



Reference: Google Earth, Imagery Date: 12/30/2016, Accessed: 10/12/2020

Scale:1" = 10 miles

NV5

792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

SITE LOCATION MAP

Project Name: AUBRUN AIRPORT HELIPAD

Location: AUBURN, CALIFORNIA

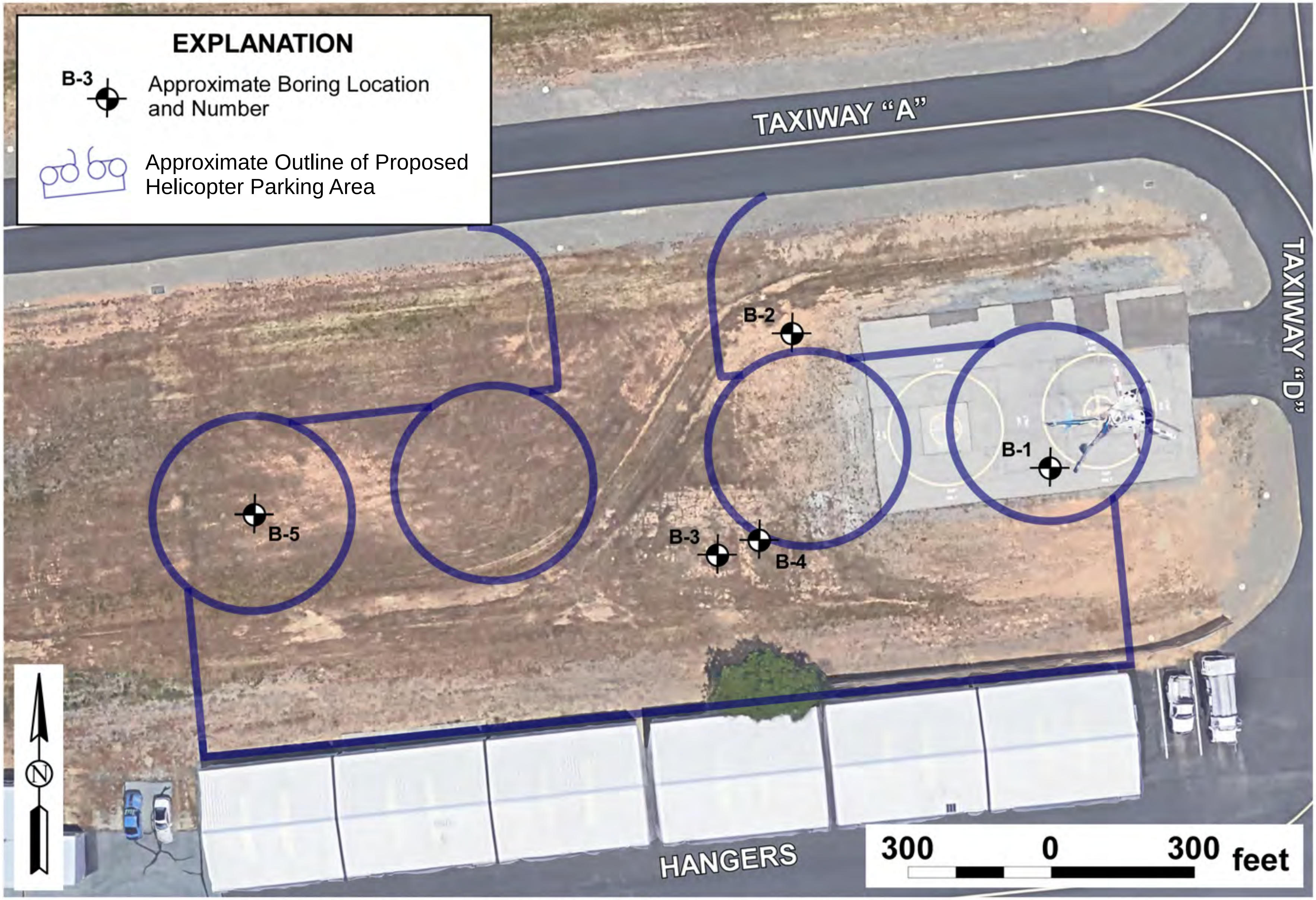
Project No.: 3783A.00

Date: OCTOBER 2020

Drawn By: WAL

Checked By: JSS

FIGURE 1



Reference: Google Earth, Imagery Date: 9/11/2019, Accessed: 10/12/2020

Scale:1" =300'

NV5
792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

EXPLORATION MAP

Project Name: AUBURN AIRPORT HELIPAD

Location: AUBURN, CALIFORNIA

Project No.: 3783A.00

Date: OCTOBER 2020

Drawn By: WAL

Checked By: JSS

FIGURE 2

APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

(Included with Permission of GBA, copyright 2016)

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org   www.geoprofessional.org

APPENDIX B

EXPLORATORY BORING LOGS

EXPLORATORY BORING LOG

NV5
792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

Boring No. B1

Project Name: AUBURN AIRPORT HELIPAD | **Project No.:** 3783A.00 | **Task:** - | **Start:** 10/12/2020

Location: AUBURN, CALIFORNIA | **Ground Elev. (Ft. MSL):** 1495 | **Finish:** 10/12/2020 | **Sheet:** 1 of 1

Logged By: J. SMITH | **Drilling Company:** H1 DRILLING | **Drill Rig Type:** TRUCK-MOUNTED MOBILE

Driller: R. HUMPHREYS | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140-LB AUTO-TRIP

Boring Dia. (In.): 3.25 | **Total Depth (Ft.):** 15.5 | **Backfill or Well Casing:** GROUT WITH ASPHALT PATCH

Ground Water Information

Date	-			
Time	-			
Depth (ft)	NFWE			

Soil and/or Rock Descriptions
(USCS Symbol; USCS Name; Field Estimated Particle Size Gradation (%); Munsel Color; Density/Consistency; Moisture; Fill Material; Dilatancy; Plasticity Toughness; Dry Strength; Structure; Cementation; Organics; Odor; Other)

Time (H:M)	Pocket Penetrometer (TSF)	SPT Blow Counts (Blows / Foot)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
11:41			HSA			0				2" ASPHALT
										7" AB
						1				
					B1-C1	1.5				(Rx) ULTRAMAFIC ROCKS; SERPENTINIZED, PERIODOTITES AND PYROXENITES W/ ALTERATIONS TO SERPANTINE, TALC, AND CHLORITE, AND OCCASIONAL FURRUGINOUS COATING; COMPLETELY TO MODERATELY WEATHERED; MODERATELY TO VERY STRONG; PALE OLIVE (10Y-5GY 6/4), LIGHT OLIVE (10Y-5GY 5/4), GREENISH GRAY (GLEY 1 5/1), WITH DARK YELLOWISH BROWN (10YR 3/6); GENERALLY EXCAVATES AS (SM) SANDY SILT, LIGHT GRAY TO LIGHT YELLOWISH BROWN.
			SPT		B1-BK1	2.5				
		61				3.5				
			HSA			4				
			SPT		B1-BK2	5				
		57				6.5				
			HSA			7				
			SPT		B1-BK3	10				
		51				11.5				[EXTREMELY OXIDIZED]
			HSA			12				
12:19		78+	SPT		B1-BK4	15				
						15.5		BOH		BOH AT 15.5'
						16–20				

NOTES: BOH = BOTTOM OF HOLE; BGS = BELOW GROUND SURFACE; NFWE = NO FREE WATER ENCOUNTERED; HSA = HOLLOW STEM AUGER; MC = MODIFIED CALIFORNIA SAMPLER; SPT = STANDARD PENETRATION TEST SAMPLER

EXPLORATORY BORING LOG

792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

Boring No. B2

Project Name: AUBURN AIRPORT HELIPAD	**Project No.:** 3783A.00	**Task:** -	**Start:** 10/12/2020
Location: AUBURN, CALIFORNIA	**Ground Elev. (Ft. MSL):** 1495		**Finish:** 10/12/2020
Sheet: 1 of 1			
Logged By: J. SMITH	**Drilling Company:** H1 DRILLING	**Drill Rig Type:** TRUCK-MOUNTED MOBILE	
Driller: R. HUMPHREYS	**Drilling Method:** HOLLOW STEM AUGER	**Hammer Type:** 140-LB AUTO-TRIP	
Boring Dia. (In.): 3.25	**Total Depth (Ft.):** 5.5	**Backfill or Well Casing:** CUTTINGS	

Ground Water Information

Date	-			
Time	-			
Depth (ft)	NFWE			

Time (H:M)	Pocket Penetrometer (TSF)	SPT Blow Counts (Blows / Foot)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions (USCS Symbol; USCS Name; Field Estimated Particle Size Gradation (%); Munsel Color; Density/Consistency; Moisture; Fill Material; Dilatancy; Plasticity Toughness; Dry Strength; Structure; Cementation; Organics; Odor; Other)
10:21			HSA			1				(CL) CLAY WITH SAND; FIELD ESTIMATE: 80% FINES, 20% SAND; REDDISH BROWN (5YR 4/4); DRY; STIFF TO HARD.
			SPT		B2-BK1					(CH) FAT CLAY WITH SAND; FIELD ESTIMATE: 80-90% FINES, 10-20% SAND; GRAYISH BROWN (2.5Y 5/2) TO (7.5YR 4/3); DAMP TO MOIST; FIRM TO STIFF; RESIDUAL SOIL.
		78+			B2-C1	2				
			HSA			3				(Rx) ULTRAMAFIC ROCKS; SERPENTINIZED, PERIODOTITES AND PYROXENITES W/ ALTERATIONS TO SERPANTINE, TALC, AND CHLORITE, AND OCCASIONAL FURRUGINOUS COATING; COMPLETELY TO MODERATELY WEATHERED; MODERATELY TO VERY STRONG; PALE OLIVE (10Y-5GY 6/4), LIGHT OLIVE (10Y-5GY 5/4), GREENISH GRAY (GLEY 1 5/1), WITH DARK YELLOWISH BROWN (10YR 3/6); GENERALLY EXCAVATES AS (SM) SANDY SILT, LIGHT GRAY TO LIGHT YELLOWISH BROWN.
						4				
						5				
10:44		78+	SPT		B2-BK2					
						6		BOH		BOH AT 5.5' DUE TO REFUSAL ON ROCK
						7				
						8				
						9				
						10				
						11				
						12				
						13				
						14				
						15				
						16				
						17				
						18				
						19				
						20				

NOTES: BOH = BOTTOM OF HOLE; BGS = BELOW GROUND SURFACE; NFWE = NO FREE WATER ENCOUNTERED; HSA = HOLLOW STEM AUGER; MC = MODIFIED CALIFORNIA SAMPLER; SPT = STANDARD PENETRATION TEST SAMPLER

EXPLORATORY BORING LOG

792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

Boring No. B3

Project Name: AUBURN AIRPORT HELIPAD	**Project No.:** 3783A.00	**Task:** -	**Start:** 10/12/2020
Location: AUBURN, CALIFORNIA	**Ground Elev. (Ft. MSL):** 1495		**Finish:** 10/12/2020

Sheet: 1 of 1

Logged By: J. SMITH	**Drilling Company:** H1 DRILLING	**Drill Rig Type:** TRUCK-MOUNTED MOBILE
Driller: R. HUMPHREYS	**Drilling Method:** HOLLOW STEM AUGER	**Hammer Type:** 140-LB AUTO-TRIP
Boring Dia. (In.): 3.25	**Total Depth (Ft.):** 15.75	**Backfill or Well Casing:** CUTTINGS

Ground Water Information

Date	-			
Time	-			
Depth (ft)	NFWE			

Time (H:M)	Pocket Penetrometer (TSF)	SPT Blow Counts (Blows / Foot)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Soil and/or Rock Descriptions
10:52			HSA			0–1	(CL) CLAY WITH SAND; FIELD ESTIMATE: 80% FINES, 20% SAND; REDDISH BROWN (5YR 4/4); DRY; STIFF TO HARD.
						1–2	(CH) FAT CLAY WITH SAND; FIELD ESTIMATE: 80-90% FINES, 10-20% SAND; GRAYISH BROWN (2.5Y 5/2) TO (7.5YR 4/3); DAMP TO MOIST; FIRM TO STIFF; RESIDUAL SOIL.
			SPT		B3-BK1	2.5	(Rx) ULTRAMAFIC ROCKS; SERPENTINIZED, PERIODOTITES AND PYROXENITES W/ ALTERATIONS TO SERPANTINE, TALC, AND CHLORITE, AND OCCASIONAL FURRUGINOUS COATING; COMPLETELY TO MODERATELY WEATHERED; MODERATELY TO VERY STRONG; PALE OLIVE (10Y-5GY 6/4), LIGHT OLIVE (10Y-5GY 5/4), GREENISH GRAY (GLEY 1 5/1), WITH DARK YELLOWISH BROWN (10YR 3/6); GENERALLY EXCAVATES AS (SM) SANDY SILT, LIGHT GRAY TO LIGHT YELLOWISH BROWN.
		42				3.5	
			HSA			4	
			SPT		B3-BK2	5.5	
			HSA			6	
		62				6.5	
			SPT		B3-BK3	10.5	
11:11		78				11.5	
			HSA			12	
			SPT		B3-BK4	15.5	
		78+				16	BOH AT 15.75'

NOTES: BOH = BOTTOM OF HOLE; BGS = BELOW GROUND SURFACE; NFWE = NO FREE WATER ENCOUNTERED; HSA = HOLLOW STEM AUGER; MC = MODIFIED CALIFORNIA SAMPLER; SPT = STANDARD PENETRATION TEST SAMPLER

EXPLORATORY BORING LOG

792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

Boring No. B4

Project Name: AUBURN AIRPORT HELIPAD | **Project No.:** 3783A.00 | **Task:** - | **Start:** 10/12/2020

Location: AUBURN, CALIFORNIA | **Ground Elev. (Ft. MSL):** 1495 | **Finish:** 10/12/2020 | **Sheet:** 1 of 1

Logged By: J. SMITH | **Drilling Company:** H1 DRILLING | **Drill Rig Type:** TRUCK-MOUNTED MOBILE

Driller: R. HUMPHREYS | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140-LB AUTO-TRIP

Boring Dia. (In.): 3.25 | **Total Depth (Ft.):** 2.5 | **Backfill or Well Casing:** CUTTINGS

Ground Water Information

Date	-			
Time	-			
Depth (ft)	NFWE			

Soil and/or Rock Descriptions
(USCS Symbol; USCS Name; Field Estimated Particle Size Gradation (%); Munsel Color; Density/Consistency; Moisture; Fill Material; Dilatancy; Plasticity Toughness; Dry Strength; Structure; Cementation; Organics; Odor; Other)

Time (H:M)	Pocket Penetrometer (TSF)	SPT Blow Counts (Blows / Foot)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
12:35			HSA			1				(CL) CLAY WITH SAND; FIELD ESTIMATE: 80% FINES, 20% SAND; REDDISH BROWN (5YR 4/4); DRY; STIFF TO HARD.
			MC	0.5/1.5'	B4-L1	2				(CH) FAT CLAY WITH SAND; FIELD ESTIMATE: 80-90% FINES, 10-20% SAND; GRAYISH BROWN (2.5Y 5/2) TO (7.5YR 4/3); DAMP TO MOIST; FIRM TO STIFF; RESIDUAL SOIL.
12:41		34				3		BOH		(Rx) ULTRAMAFIC ROCKS; SERPENTINIZED, PERIODOTITES AND PYROXENITES W/ ALTERATIONS TO SERPANTINE, TALC, AND CHLORITE, AND OCCASIONAL FURRUGINOUS COATING; COMPLETELY TO MODERATELY WEATHERED; MODERATELY TO VERY STRONG; PALE OLIVE (10Y-5GY 6/4), LIGHT OLIVE (10Y-5GY 5/4), GREENISH GRAY (GLEY 1 5/1), WITH DARK YELLOWISH BROWN (10YR 3/6); GENERALLY EXCAVATES AS (SM) SANDY SILT, LIGHT GRAY TO LIGHT YELLOWISH BROWN.
						4				BOH AT 2.5' DUE TO REFUSAL ON ROCK
						5				
						6				
						7				
						8				
						9				
						10				
						11				
						12				
						13				
						14				
						15				
						16				
						17				
						18				
						19				
						20				

NOTES: BOH = BOTTOM OF HOLE; BGS = BELOW GROUND SURFACE; NFWE = NO FREE WATER ENCOUNTERED; HSA = HOLLOW STEM AUGER; MC = MODIFIED CALIFORNIA SAMPLER; SPT = STANDARD PENETRATION TEST SAMPLER

EXPLORATORY BORING LOG

792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

Boring No. B5

Project Name: AUBURN AIRPORT HELIPAD | **Project No.:** 3783A.00 | **Task:** - | **Start:** 10/12/2020

Location: AUBURN, CALIFORNIA | **Ground Elev. (Ft. MSL):** 1495 | **Finish:** 10/12/2020 | **Sheet:** 1 of 1

Logged By: J. SMITH | **Drilling Company:** H1 DRILLING | **Drill Rig Type:** TRUCK-MOUNTED MOBILE

Driller: R. HUMPHREYS | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140-LB AUTO-TRIP

Boring Dia. (In.): 3.25 | **Total Depth (Ft.):** 9.25 | **Backfill or Well Casing:** CUTTINGS

Ground Water Information

Date	-			
Time	-			
Depth (ft)	NFWE			

Soil and/or Rock Descriptions
(USCS Symbol; USCS Name; Field Estimated Particle Size Gradation (%); Munsel Color; Density/Consistency; Moisture; Fill Material; Dilatancy; Plasticity Toughness; Dry Strength; Structure; Cementation; Organics; Odor; Other)

Time (H:M)	Pocket Penetrometer (TSF)	SPT Blow Counts (Blows / Foot)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
12:49			HSA			0–2				(CL) CLAY WITH SAND; FIELD ESTIMATE: 80% FINES, 20% SAND; REDDISH BROWN (5YR 4/4); DRY; STIFF TO HARD.
		78+	MC	0.5/1.5'	B5-L1	2.5–4				(Rx) ULTRAMAFIC ROCKS; SERPENTINIZED, PERIODOTITES AND PYROXENITES W/ ALTERATIONS TO SERPANTINE, TALC, AND CHLORITE, AND OCCASIONAL FURRUGINOUS COATING; COMPLETELY TO MODERATELY WEATHERED; MODERATELY TO VERY STRONG; PALE OLIVE (10Y-5GY 6/4), LIGHT OLIVE (10Y-5GY 5/4), GREENISH GRAY (GLEY 1 5/1), WITH DARK YELLOWISH BROWN (10YR 3/6); GENERALLY EXCAVATES AS (SM) SANDY SILT, LIGHT GRAY TO LIGHT YELLOWISH BROWN.
			HSA			3.5–5.5				
		78+	SPT			5.5–7				
			HSA			7–9				
13:21		78+	SPT			9–9.25		BOH		BOH AT 5.5' DUE TO REFUSAL ON ROCK

NOTES: BOH = BOTTOM OF HOLE; BGS = BELOW GROUND SURFACE; NFWE = NO FREE WATER ENCOUNTERED; HSA = HOLLOW STEM AUGER; MC = MODIFIED CALIFORNIA SAMPLER; SPT = STANDARD PENETRATION TEST SAMPLER

APPENDIX C

LABORATORY TEST DATA

ATTERBERG INDICES

ASTM D4318

DSA File #:

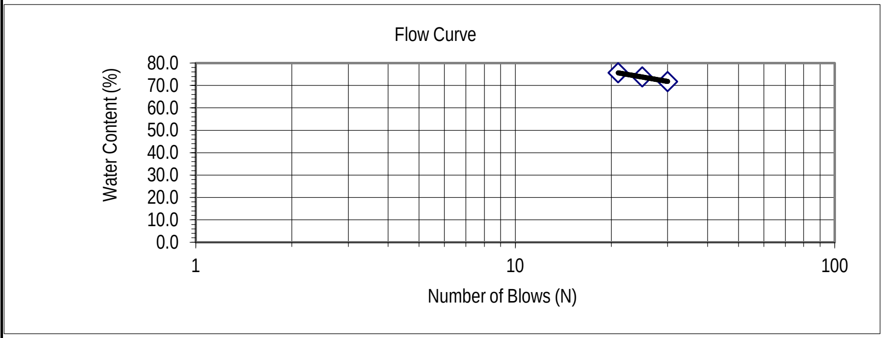
DSA Appl #:

Project No.:	**3783A.00**	Project Name:	**AUN New Helicopter Parking**	Date:	**10/22/2020**
Sample No.:	**B4-L1**	Boring/Trench: **B4**	Depth, (ft.): **-**	Tested By:	**GWO/SLN**
Description:	**Brown (7.5YR 4/3) Fat Clay with Sand**			Checked By:	**MLH**
Sample Location:				Lab. No.:	**15-20-529**

Estimated % of Sample Retained on No. 40 Sieve: 5 | Sample Air Dried: yes

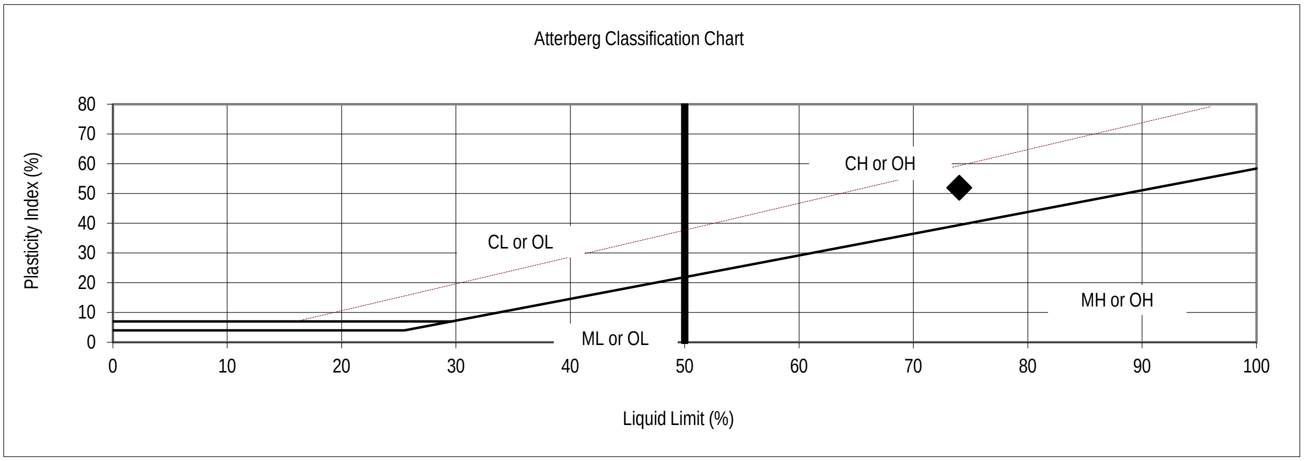
Test Method A or B: A

	LIQUID LIMIT:					PLASTIC LIMIT:		
Sample No.:	1	2	3	4	5	1	2	3
Pan ID:	2	T	22			B	PI	
Wt. Pan (gr)	15.29	15.04	15.32			15.36	15.30	
Wt. Wet Soil + Pan (gr)	21.32	20.15	21.01			21.36	21.37	
Wt. Dry Soil + Pan (gr)	18.80	17.98	18.56			20.27	20.26	
Wt. Water (gr)	2.52	2.17	2.45			1.09	1.11	
Wt. Dry Soil (gr)	3.51	2.94	3.24			4.91	4.96	
Water Content (%)	71.8	73.8	75.6			22.2	22.4	
Number of Blows, N	30	25	21					
				LIQUID LIMIT =	74		PLASTIC LIMIT =	22



Plasticity Index = 52

Group Symbol = CH

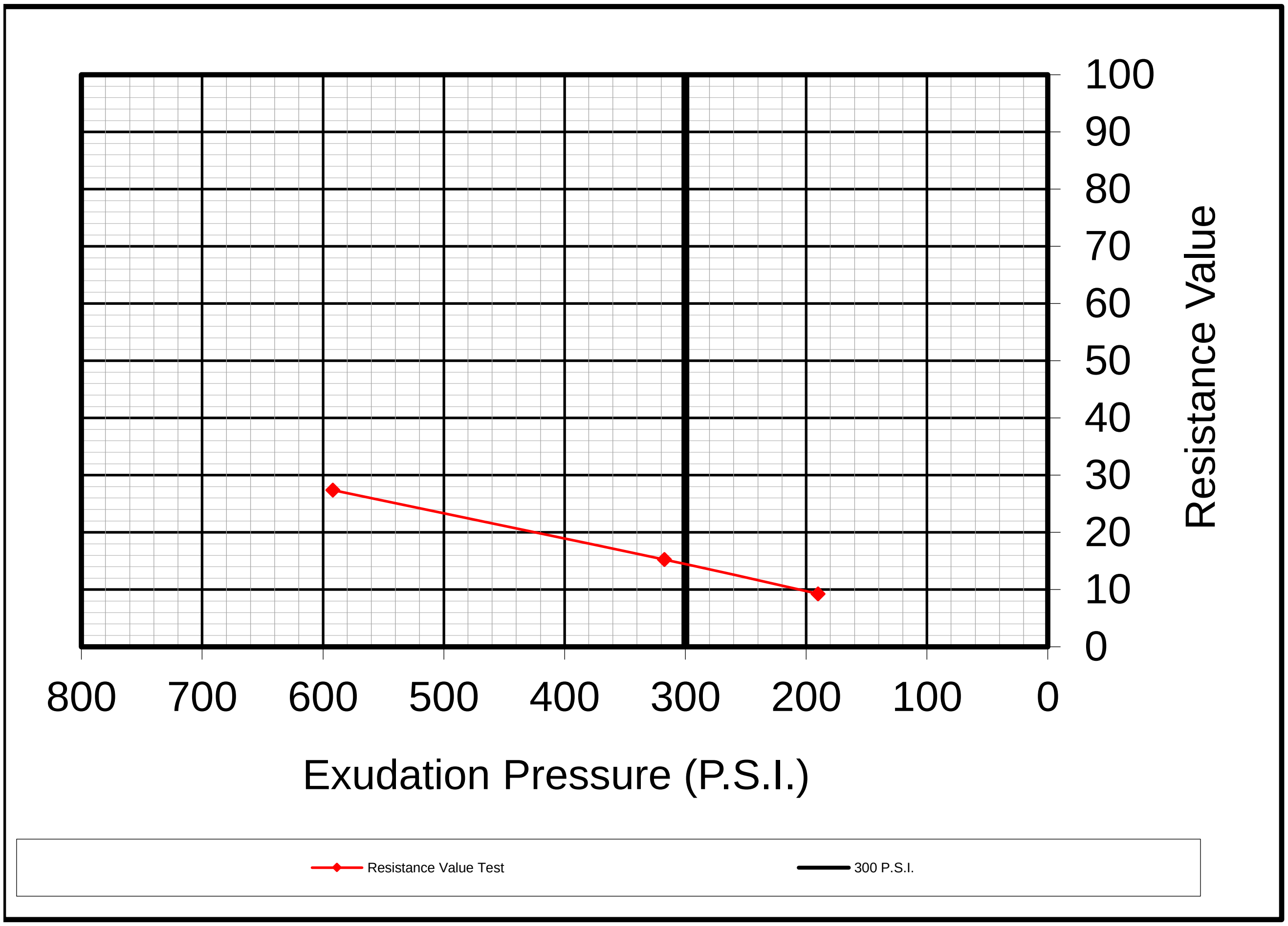


Pavement Engineering Inc.
Redding • Sacramento • San Luis Obispo
Concord • Santa Clarita

RESISTANCE (R) VALUE TEST

California Test 301

PEI Laboratory No.:	L202791	**NV5 Project Name:**	AUN New Helicoptor Parking
PEI Client:	NV5 (Holdrege & Kull)	**NV5 Project No.:**	3783A.00
PEI Project Name:	2020 Laboratory Testing	**NV5 Date Sampled:**	10/15/2020
PEI Project No.:	200018-01	**NV5 Office:**	Nevada City
Report Date:	October 19, 2020	**NV5 Engineer:**	John Atkinson
Sample Description:	Brown Clay (comp of B1 & B2)	**NV5 PO No.:**	15-20-529
		NV5 Sample ID:	



Specimen No.	7	8	9
Moisture Content (%)	16.0	17.2	15.5
Dry Density (PCF)	117.1	115.8	119.4
Resistance Value (R)	15	9	27
Exudation Pressure (PSI)	317	190	592
Expansion Pressure	152	91	255
As Received Moisture Content (%)	16.0		

RESISTANCE VALUE AT 300 P.S.I. **14**

AAP® AASHTO R18

Reviewed By:

Brandon Rodebaugh
Materials Engineer

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 10/21/2020
Date Submitted 10/16/2020

To: Michelle Holub
Holdrege & Kull
792 Searls Ave.
Nevada City, CA 95959

From: Gene Oliphant, Ph.D. \ Randy Horney RA
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3783A.000 Site ID : B3-BK1.
Your purchase order number is 1520529.
Thank you for your business.

* For future reference to this analysis please use SUN # 83268-173768.

EVALUATION FOR SOIL CORROSION

Soil pH	6.26	
Minimum Resistivity	1.45 ohm-cm (x1000)	
Chloride	2.3 ppm	00.00023 %
Sulfate	5.1 ppm	00.00051 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B

Geotechnical Report

GEOTECHNIAL ENGINEERING REPORT

AUBURN MUNICIPAL AIRPORT – NEW HELICOPTER PARKING AREA

APN 052-010-028-000
AUBURN, PLACER COUNTY, CALIFORNIA

NOVEMBER 13, 2020

PREPARED FOR:

JACOBS ENGINEERING GROUP INC

707 17TH STREET, SUITE 2400
DENVER, COLORADO 80202

N|V|5

792 SEARLS AVENUE
NEVADA CITY, CA 95959

PROJECT NO. 4455.00.01

Project No. 3783A.00
November 13, 2020

Jacobs Engineering Group Inc
707 17th Street, Suite 2400
Denver, Colorado 80202-5131

Attention: Jesus Moncada, PE, Senior Project Manager

Reference: **Auburn Municipal Airport – New Helicopter Parking Area**
APN 052-010-028-000
Auburn, Placer County, California

Subject: Geotechnical Engineering Report

Dear Mr. Moncada:

This report presents the results of our geotechnical engineering investigation for the proposed helicopter parking area to be constructed at the Auburn Municipal Airport (AUN) in Auburn, California. As proposed, the project is likely to include construction of a new helicopter parking area, comprised of four helipads, and access roadway located southwest of Taxiways "A" and "D."

The findings presented in this report are based on our subsurface investigation, laboratory test results, and our experience with subsurface conditions in the area. Our opinion is that the project can be completed as proposed, provided the recommendations presented in this report are implemented. Our primary concern, from a geotechnical engineering standpoint, includes the presence of shallow potentially expansive soil. Recommendations for mitigating potentially expansive soil are presented in the report.

Please contact us if you have any questions regarding our observations or the recommendations presented in this report.

Sincerely,

NV5

Prepared by:

Janina S. Smith
Staff Engineer

Reviewed by:

Chuck R. Kull, GE 2359, CEG 1622
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER CHARLES R. KULL No. 2359 GEOTECHNICAL STATE OF CALIFORNIA

REGISTERED GEOLOGIST CHARLES R. KULL No. 1622 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

Sent via U.S. Mail and Email to Jesus.Moncada@jacobs.com

F:\1 Projects\3783 Auburn Airport Helipad\3783A.00\Gtk Report\01 Text\3783A.00_AUN New Helicopter Parking_Geotechnical Report.docx

TABLE OF CONTENTS

ATTACHMENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

At the request of Jacobs Engineering Group Inc (Jacobs), NV5 performed a geotechnical investigation of the proposed helicopter parking area to be constructed at the Auburn Municipal Airport (AUN) in Auburn, California. The project area comprises Placer County assessor parcel number (APN) 052-010-028-00. The subject project area is herein referred to as the “project site.”

The geotechnical investigation was performed in general accordance with our proposal for the project, dated December 31, 2019. For your review, Appendix A contains a document prepared by Geoprofessional Business Association (GBA) entitled Important Information about Your Geotechnical Engineering Report, which summarizes the general limitations, responsibilities, and use of geotechnical reports.

1.1 SITE DESCRIPTION

The project site is located at the Auburn Municipal Airport in Auburn, California, and is located southwest of Taxiways “A” and “D.” The project site is accessed by Rickenbacker Way or New Airport Road. The Auburn Municipal Airport is bordered by undeveloped and residential property to the north, east and west, and by commercial properties to the south and southwest. A site location map is presented as Figure 1.

At the time of our field investigation, the Auburn Municipal Airport was active with airplane and helicopter traffic. The proposed helicopter parking area was comprised of existing helicopter parking (two helipads) to the east and a clear area covered with short grasses to the west. In general, the east and west portions of the project site were transected by a northeast to southwest trending moderate grade slope approximately 3 feet in height. Figure 2 shows approximate locations of the existing helicopter parking, hangars, and taxiways, as well as an outline of the proposed helicopter parking area.

1.2 PROPOSED IMPROVEMENTS

Based on conversations with Jacobs and review of a preliminary site plan, we understand that the proposed improvements will likely include construction of a new helicopter parking area, comprising four helipads, and access roadway located southwest of taxiways “A” and “D.” Appurtenant construction will likely include a drainage swale between taxiway “A” and the proposed helicopter parking area, with a culvert constructed under the proposed access roadway. We anticipate that grading for the project will include fill for raising grade in the western portion of the parking area and access roadway.

1.3 PURPOSE

We performed a surface reconnaissance and subsurface geotechnical investigation at the project site, collected soil samples for laboratory testing, and performed engineering calculations to provide grading and pavement recommendations for the proposed improvements.

1.4 SCOPE OF SERVICES

To prepare this report, we performed the following scope of services:

- We performed a site investigation, including a literature review and field investigation.
- We collected relatively undisturbed soil samples and bulk soil samples from selected exploratory borings.
- We performed laboratory tests on select soil samples obtained during our field investigation to determine their engineering material properties.
- Based on observations made during our field investigation and the results of laboratory testing, we performed engineering calculations to provide geotechnical engineering recommendations for earthwork and pavement improvements.

Our scope of services did not include a groundwater flow analysis, nor an evaluation of the project site for the presence of hazardous materials, historic mining features, asbestiform minerals, or mold.

2.0 SITE INVESTIGATION

We performed a site investigation to characterize the existing surface conditions and shallow subsurface soil/rock conditions. Our site investigation included a literature review and field investigation as described below.

2.1 LITERATURE REVIEW

We performed a limited review of geologic literature pertaining to the project site. The following sections summarize our findings.

2.1.1 Soil Survey

As part of our study, we reviewed the Web Soil Survey (United States Department of Agriculture [USDA] Natural Resource Conservation Service [NRCS]; *https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx*). The soil survey indicates that the project site is located in an area containing Auburn-Argonaut complex, 2 to 5 percent slopes. The soil survey describes the Auburn and Argonaut soil types as well drained soils. The Auburn soil is shallow and formed in residuum from vertically tilted basic schist and slate. The Argonaut soil is moderately deep and formed in residuum from metabasic rock.

A typical profile of the Auburn soil type is described as a surface layer of strong brown to yellowish red silt loam to a depth of 20 inches below the ground surface (bgs), underlain by partly weathered basic schist.

A typical profile of the Argonaut soil type is described as a surface layer of strong brown loam to a depth of 4 inches bgs. The loam is typically underlain by yellowish red silt loam to a depth of 9 inches bgs. The silt loam is typically underlain by yellowish red clay loam to a depth of 16 inches bgs. A yellowish brown with patches of yellowish red clay is generally observed below the clay loam, to a depth of 25 inches bgs. Weathered basic schist typically underlies the clay.

2.1.2 Geologic Setting

According to the Mineral Land Classification of Placer County, Department of Conservation, Division of Mines and Geology, DMG Open File Report 95-10 (1995), the project site is generally located in an area mapped as Mesozoic and Paleozoic serpentinized ultramafic rock. The Mesozoic and Paleozoic eras span the time from 540 to 65 million years before present (MYBP).

The referenced geologic map indicates that the project site is likely underlain by serpentinized ultramafic rock, often associated with naturally occurring asbestos (NOA). During our site investigation, we encounter serpentinized ultramafic rock in our borings. If ultramafic rock, serpentinite or NOA-containing minerals are encountered during grading activities, site grading would be regulated under Cal/EPA Air Resources Board Regulation 93105, Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (ATCM) and Placer County Rule 228, Fugitive Dust. We anticipate that, as a minimum, dust mitigation measures such as limiting site access, restricting onsite construction vehicle speeds, covering stockpiled soil, and liberal use of water during grading will be required during grading to prevent the generation of dust from the project site. We can prepare an asbestos dust mitigation plan (ADMP), if required, for project planning and approval purposes.

We reviewed California Geological Survey Open File Report 96-08, *Probabilistic Seismic Hazard Assessment for the State of California*, and the 2002 update entitled *California Fault Parameters*. The documents indicate the project site is located within the Foothills Fault System. The Foothills Fault System is designated as a Type C fault zone, with low seismicity and a low rate of recurrence. The 1997 edition of California Geological Survey Special Publication 42, Fault Rupture Hazard Zones in California, describes active faults and fault zones (activity within 11,000 years), as part of the Alquist-Priolo Earthquake Fault Zoning Act. The map and document indicate the project site is not located within an Alquist-Priolo active fault zone.

2.2 FIELD INVESTIGATION

We performed our field investigation on April 22, 2020. During our field investigation, we observed the local topography and surface conditions and performed a subsurface investigation. The following sections summarize surface and subsurface conditions observed during our field investigation.

Our subsurface investigation included the excavation of 5 exploratory borings across the project site. We excavated to depths ranging between 5.5 and 15.75 feet below the ground surface (bgs) using a CME 75 drill rig equipped with 3.25-inch hollow stem augers and a 140 pound automatic hammer. After sampling, borings B2 through B5 were backfilled with drill cuttings, and boring B1 was backfilled with drill cuttings and covered with an asphalt patch. A staff engineer from our firm logged the soil conditions revealed in the exploratory borings and collected relatively undisturbed and bulk soil samples for laboratory testing. Figure 2 shows the approximate exploratory boring locations, and were determined approximately by pacing their distance from features onsite and should be considered accurate only to the degree implied by the method used.

2.2.1 Surface Conditions

At the time of our field investigation, the proposed helicopter parking area consisted of existing helicopter parking (two helipads) to the east and a clear area covered with short grasses to the west. The proposed helicopter parking area was bordered by taxiway “A” to the north, taxiway “D” to the east, hangars to the south, and a clear grassy area to the west. A drainage swale was observed between the existing helicopter parking area and taxiway “A” (to the north). The existing helicopter parking, taxiways, and hanger areas were covered with asphaltic concrete (AC) pavement.

Site topography in the area of the proposed helicopter parking area was generally flat, except for an approximately 3-foot high, moderate slope, transecting the project site from northeast to southwest, and a gentle graded slope located along the southern project site boundary (north of the existing hangers). According to Google Earth, site topography from east to west across the project site generally trends from approximately 1497 to 1490 feet above mean sea level (AMSL).

2.2.2 Subsurface Soil Conditions

The following described soil conditions are generalized, based on our interpretation of the subsurface soil, groundwater, and bedrock conditions observations in our 5 exploratory borings.

The relatively consistent soil conditions encountered in our exploratory borings indicate that such conditions are present in the near vicinity of the boring locations. Subsurface conditions may vary at other locations and times. The location of the soil and bedrock boundaries should be considered approximate. The transition between soil and bedrock types may be gradual. More detailed information can be found in the boring logs in Appendix B.

Boring B-1, located at the existing helicopter parking, was advanced through approximately 2 inches of asphalt and 7 inches of aggregate base (AB). The pavement section was underlain by moderately to very strong, completely to moderately weathered, ultramafic rock that excavated as light gray to light yellowish brown sandy silt. Boring B-1 was terminated in weathered rock at 15.5 feet below ground surface (bgs).

Boring B-2 through B-4 were advanced through approximately 0.75 to 1.0 feet of surface soil generally described as reddish brown, stiff to hard, dry, clay with sand. The surface soil was underlain by grayish brown to brown, firm to stiff, dry to damp, fat clay with sand (residual soil) to depths of approximately 1.5 feet bgs. Underlying the residual soil was moderately to very strong, completely to moderately weathered, ultramafic rock that excavated as light gray to light yellowish brown sandy silt. Borings B-2 and B-4 were terminated upon refusal on rock at depths of 5.5 and 2.5 feet bgs, respectively. Boring B-3 was terminated in weathered rock at 15.75 feet bgs.

Boring B5 was advanced through approximately 1.75 feet of surface soil generally described as reddish brown, stiff to hard, dry, clay with sand. The surface soil was underlain by moderately to very strong, completely to moderately weathered ultramafic rock that excavated as light gray to light yellowish brown sandy silt. Borings B-5 was terminated upon refusal on rock at 5.5 feet bgs.

2.2.3 Groundwater Conditions

During our field investigation, we did not encounter groundwater seepage in our exploratory borings, nor did we observe onsite springs or seeps emanating from the ground surface. Our observations of groundwater conditions were made in October 2020 following a period of relatively dry weather. Although we did not observe groundwater in our exploratory borings, our experience has shown that seepage may be encountered in excavations which reveal the soil/weathered rock transition, particularly during or after the rainy season.

3.0 LABORATORY TESTING

We performed laboratory tests on selected soil samples collected from our subsurface exploratory borings to determine their engineering material properties. These engineering material properties were used to develop geotechnical engineering design recommendations for earthwork and pavement improvements. We performed the following laboratory tests:

- Atterberg Limits (ASTM D4318)
- Resistance Value (D2844)
- Minimum Soil Resistivity (Caltrans Method 643)
- Sulfate and Chloride (Caltrans Method 417 and 422M)

In general, relatively undisturbed soil samples were collected for laboratory testing within the upper 5 feet of the borings. Appendix D presents laboratory test data.

We performed an Atterberg limits determination on a sample collected at approximately 1.0 feet bgs from boring B-4 (B4-L1). The Atterberg limits determination revealed that the portion of the sample passing the No. 40 sieve had a liquid limit of 74 and a plastic limit of 22, resulting in a plasticity index of 52. Based on the Atterberg limits determination, we classified the soil as a clay with high plasticity (CH).

We were unable to performed expansion index testing on sample B4-L1 or additional samples of the same clayey soil due to low sample recovery. Based on the Atterberg limits determination we classified the soil as a fat clay (CH) with high plasticity.

One R-value test was performed on a composite bulk sample obtained from Borings B-1 and B-2 from 1.0 to 5.0 feet bgs. The test indicated that the predominantly fine-grained soil had an R-value of 14, by exudation pressure. Based on our experience in the area and the subsurface conditions revealed during our investigation, we elected to use a design R-value of 12. Selective grading during construction could be performed to place more granular material in the upper 18-24 inches of subgrade to increase durability and reduce baserock sections.

A soil sample was collected from Boring B-3 at 2.0 feet bgs for corrosion testing. Corrosion testing, including pH, minimum resistivity, sulfate content and chloride content, was performed by Sunland Analytical in accordance with CA DOT test methods 643, 417, and 422m. Table 3.0-1 summarizes the test results. Based on the limited tests, the soil is moderately corrosive to buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron. Test results are discussed further in section 5.1.9, “Soil Corrosion Potential.” The laboratory report is included in Appendix C.

Table 3.0-1: Summary of Corrosion Testing

Boring/ Sample Number	Sample Depth (feet)	pH	Minimum Resistivity (ohms-cm)	Chloride Content (ppm)	Sulfide Content (ppm)
B-3 / B3-BK1	2.0	6.26	1,450	2.3	5.1
Notes: Ohms-cm = ohms centimeter ppm = parts per million					

4.0 CONCLUSIONS

The following conclusions are based on our field observations, laboratory test results, and our experience in the area.

1. Our opinion is that the project site is suitable for the proposed improvements, provided that the geotechnical engineering recommendations and design criteria presented in this report are incorporated into the project plans.
2. Based on our site observations, the geology of the region, and our experience in the area, our opinion is that the risk of seismically induced hazards such as slope instability, liquefaction, and surface rupture are remote at the project site.
3. Based on the site geology and our observation of the surface conditions, we anticipate that grading and excavation onsite will reveal variably weathered, fractured, ultramafic rock. Areas of resistant rock may be encountered which may require splitting or hammering to increase the rate of excavation.
4. We did not encounter existing fill in our exploratory borings. If existing fill is encountered during construction, we should be retained to evaluate the condition of the fill, and to make recommendations to mitigate the presence of fill, if necessary. Existing fill, if encountered, should not be relied upon to support proposed improvements without testing and evaluation.
5. Fat Clay was encountered at shallow depths in our exploratory borings. Expansive near-surface soils shrink and swell as they lose and gain moisture throughout the yearly weather cycle. Near the surface, the resulting movements can heave and crack lightly loaded slabs and pavements. Recommendations regarding fine grained, potentially expansive soils are presented in this report.
6. During our site investigation, we did encounter serpentinized ultramafic rock. Furthermore, the referenced geologic map indicates that portions of the project site are likely underlain by serpentinite, a rock often associated with naturally occurring asbestos (NOA). If ultramafic rock, serpentinite or NOA-containing minerals are encountered at the project site, site grading would be regulated under Cal/EPA Air Resources Board Regulation 93105, Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (ATCM). We anticipate that, as a minimum, dust mitigation measures such as limiting site access, restricting onsite construction vehicle speeds, covering stockpiled soil, and liberal use of water during grading will be required during grading to prevent the generation of dust from the project site. We can prepare an asbestos dust mitigation plan (ADMP), if required, for project planning and approval purposes.

7. Although we did not observe shallow groundwater or seepage during our field investigation, areas of seepage may be encountered during grading onsite, particularly during the rainy season and/or in excavations which reveal the surface soil/weathered rock contact. Preliminary recommendations regarding construction dewatering are presented in this report.
8. Prior to grading and construction, we should be retained to review the proposed grading plan to confirm our recommendations.

5.0 RECOMMENDATIONS

The following geotechnical engineering recommendations are based on our understanding of the project as currently proposed, our field observations, the results of our laboratory testing program, engineering analysis, and our experience in the area.

5.1 GRADING

The following sections present our grading recommendations. The grading recommendations address clearing and grubbing, expansive soil, soil preparation for fill placement, engineered fill, fill slope grading, erosion control, surface water and subsurface drainage, soil corrosion potential, plan review, and construction monitoring.

5.1.1 Clearing and Grubbing

Areas proposed for fill placement, roadway, and parking area construction should be cleared and grubbed to remove vegetation, weak and porous soils, and other deleterious materials as described below. We anticipate that clearing and grubbing will be minimal at the project site.

1. Strip and remove debris from clearing operations and the weak and porous soil containing shallow vegetation, roots and other deleterious materials. We anticipate that the depth of grubbing and clearing would be between 1 and 3 inches, but the actual depth of stripping will vary across the project site. The organic topsoil can be stockpiled onsite and used in landscape areas but is not suitable for use as engineered fill. The project geotechnical engineer should approve any proposed use of the spoil generated from stripping prior to placement on the project site.
2. Overexcavate any relatively loose debris and soil that is encountered in our exploratory borings or any other onsite excavations to underlying, competent material. Possible excavations include exploratory trenches excavated by others, mantles or soil test pits, and holes resulting from tree stump or boulder removal.
3. If loose, untested fill is encountered during site development, overexcavate to competent native soil or weathered rock and replace with engineered fill in accordance with Sections 5.1.3, “Soil Preparation for Fill Placement,” and 5.1.4, “Engineered Fill,” of this report.
4. Fat clay was encountered in our exploratory borings between depths of 0.75 and 1.5 feet bgs. Fine grained, potentially expansive soil, as determined by NV5, that is encountered during grading should be overexcavated and stockpiled for removal, mixed as directed by NV5, or used in landscape areas. Recommendations for mitigating potentially expansive soil is presented in Section 5.1.2, “Expansive Soil,” of this report.

5. All rocks greater than 8 inches in greatest dimension (oversized rock) should be removed from the top 12 inches of native soil, if encountered. Oversized rock may be used in landscape areas, rock landscape walls, rock faced slopes, or removed from the project site.
6. Vegetation, deleterious materials, pavement debris, and oversized rocks not used in landscape areas, drainage channels, or other non-structural uses should be removed from the project site.

5.1.2 Expansive Soil

Based on the results of our field investigation and laboratory testing, fine-grained potentially expansive soil is present on the project site. Expansive soil is characterized by its ability to undergo significant volume change (shrink/swell) due to fluctuations in moisture content. Changes in soil moisture content can result from rainfall, landscape irrigation, perched groundwater, drought, or other factors and may cause unacceptable settlement or heave of structures, concrete slabs-on-grade, or pavements supported over these materials.

Expansive soil is typically identified by the presence of smaller clay minerals. Soil properties with the potential for swelling include a plasticity index (PI) greater than 15 and an Elastic Index (EI) greater than 20.

Expansive soil, where encountered, should be over-excavated to underlying competent native soil or weathered rock, or a minimum depth of 2 feet below slabs-on-grade and pavement sections. Over-excavations should extend a minimum 2 feet laterally from the edge of hardscapes. Over-excavations should be backfilled with approved non-expansive soil, placed and compacted in accordance with the following grading recommendations. Excavated expansive soil(s) should either be disposed off-site, placed in non-structural areas, or placed within the lower portion of deep fills.

It may be possible to mix potentially expansive soil with granular soil in order to reuse the material as structural fill. The actual mix ratio should be evaluated by NV5 at the time of construction, but a typical mix ratio for this type of application is about 4 parts granular soil to 1 part expansive soil. We recommend that an NV5 representative be present during site grading and earthwork to evaluate the implementation of our recommendations and provide additional or revised recommendations, if needed.

5.1.3 Soil Preparation for Fill Placement

Where fill placement is proposed, the surface soil exposed by site clearing and grubbing should be prepared as described below.

1. The surface soil should be scarified to a minimum depth of 12 inches below the existing ground surface, or to resistant rock, whichever is shallower. Following scarification, the soil should be uniformly moisture conditioned to within approximately 3 percentage points of the ASTM D1557 optimum moisture content.
2. The scarified and moisture conditioned soil should then be compacted to achieve a minimum relative compaction of 90 percent based on ASTM D1557 maximum dry density. The moisture content, density, and relative percent compaction should be verified by a representative of NV5. The earthwork contractor should assist our representative by excavating test pads with onsite earth moving equipment.

3. The native soil surface should be graded to minimize ponding of water and to drain surface water away from the proposed helicopter parking area. Where possible, surface water should be collected, conveyed and discharged into natural drainage courses or drainage swells.

5.1.4 Engineered Fill

All fill placed beneath pavement and as part of fill slopes should be considered structural engineered fill. Soil fill placement proposed for the project should incorporate the following recommendations:

1. Soil used to construct engineered fills should be non-expansive, free of deleterious, and consist predominantly of materials less than ½-inch in greatest dimension and should not contain rocks greater than 3 inches in greatest dimension (oversized material). Soil should have a plasticity index (PI) of less than or equal to 15, as determined by ASTM D4318 Atterberg Indices testing. If encountered, rock used in fill should be broken into pieces no larger than 3 inches in diameter. Rocks larger than 3 inches are considered oversized material and should be stockpiled for offhaul or later use in landscape areas and drainage channels. The contractor could use a rock rake or screen to remove oversized rocks.
2. Import soil should be predominantly granular, non-expansive and free of deleterious material. In general, the import soil should have a plasticity index less than 15 with 100% passing a 3-inch screen and less than 15% passing a No. 200 sieve. Prior to importation to the project site, the source generator should document that the import fill meets the guidelines set forth by the California Regional Water Quality Control Board and/or California Environmental Protection Agency (CalEPA) Department of Toxic Substances Control (DTSC) "Information Advisory, Clean Imported Fill Material" (2001). This advisory represents the best practice for characterization of soil prior to import for use as engineered fill. The Contractor should understand that they are responsible for importing soil that meets the regulatory guidelines. Import material that is proposed for use onsite should be submitted to NV5 for approval and possible laboratory testing at least 72 hours prior to transport to the site.
3. Engineered soil used to construct fill should be uniformly moisture conditioned to within approximately 3 percentage points of the ASTM D1557 optimum moisture content. Wet soil may need to be air dried or mixed with drier material to facilitate placement and compaction, particularly during or following the wet season.
4. Fill should be constructed by placing uniformly moisture conditioned soil in maximum 8-inch-thick loose, horizontal lifts (layers) prior to compacting.
5. All fill should be compacted to a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. The upper 12 inches of fill in paved areas or proposed slabs-on-grade should be compacted to a minimum of 95 percent relative compaction.
6. The earthwork contractor should compact each loose soil lift with a tamping foot compactor such as a Caterpillar (CAT) 815 Compactor or equivalent as approved by NV5's project engineer or his/her field representative. A smooth steel drum roller compactor should not be used to compact loose soil lifts for construction of engineered fills.

7. The prepared finished grade or finished subgrade soil surface should be proof-rolled with a fully loaded, 4,000-gallon-capacity water truck with the rear of the truck supported on a double-axle, tandem-wheel undercarriage or approved equivalent. The proof-rolled surface should be visually observed by the project engineer or his/her field representative to be firm, competent and relatively unyielding.

5.1.5 Fill Slope Grading

Based on our understanding of the project, we anticipate that fill slopes will be created as part of the proposed development. In general, permanent fill slopes should be no steeper than 2:1 (H:V).

The fill must be benched into existing side slopes as fill placement progresses. Benching must extend through loose surface soil into firm material, and at intervals such that no loose surface soil is beneath the fill. As a minimum, a horizontal bench should be excavated every 5 vertical feet or as determined by a representative of NV5.

Fill should be placed in horizontal lifts to the lines and grades shown on project plans. Fill slopes should not be constructed or extended horizontally by placing soil on an existing slope face and/or compacted by track walking.

Slopes should be constructed by overbuilding the slope face and then cutting it back to the design slope gradient and grade.

5.1.6 Erosion Controls

Graded portions of the project site should be seeded as soon as possible to allow vegetation to become established prior to and during the rainy season. In addition, grading that results in greater than one acre of soil disturbance or in sensitive areas may require the preparation of a site-specific stormwater pollution prevention plan. As a minimum, the following controls should be installed prior to and during grading to reduce erosion.

1. Prior to commencement of site work, fiber rolls should be installed down slope of the proposed area of disturbance to reduce migration of sediment from the project site. Fiber rolls on slopes are intended to reduce sediment discharge from disturbed areas, reduce the velocity of water flow, and aid in the overall revegetation of slopes. The fiber rolls should remain in place until construction activity is complete and vegetation becomes established.
2. Erosion controls should be installed on all cut and fill slopes to minimize erosion caused by surface water runoff.
3. All soil exposed in permanent slope faces should be hydroseeded or hand seeded/strawed with an appropriate seed mixture compatible with the soil and climate conditions of the project site as recommended by the local Resource Conservation District. Alternatively, an appropriate manufactured erosion control mat may be applied.
4. Install surface water drainage ditches at the top of cut and fill slopes (as necessary) to intercept and redirect concentrated surface water away from cut and fill slope faces. Under no circumstances should concentrated surface water be directed over slope faces. The intercepted water should be discharged into natural drainage courses or into other collection and disposal structures.

5. If grading is performed during wet weather, exposed soil may be susceptible to excessive disturbance. This could create a situation where previously completed earthwork needs to be repaired, possibly leading to project delays. Sediment and erosion control efforts, particularly stormwater mitigation, should be implemented in accordance with local accepted industry standards and best management practices.

5.1.7 Surface Water Drainage

Final site grading should be planned so that surface water is directed away from all slopes and hardscapes, including pavements, as described below.

1. Slope final grades so that surface water drains away from the proposed helicopter parking area finished subgrade at a minimum 2 percent slope for a minimum distance of 10 feet. Ponding of surface water should not be allowed on or near the edge of pavements.
2. Direct surface water off the helicopter parking area so that concentrated flow over fill areas does not cause erosion.
3. We anticipate that the existing drainage swale located between the existing helicopter parking area and taxiway "A" will need to be extended across the proposed fill. We also anticipate a culvert will be installed beneath the proposed access road, which is to be constructed across the drainage swell.
4. Drainage gradients should be maintained to carry all surface water to a properly designed infiltration facility.

5.1.8 Subsurface Drainage

If grading is performed during or immediately following the rainy season, seepage will likely be encountered. If groundwater or saturated soil conditions are encountered during grading, we anticipate that dewatering may be possible by gravity or by temporary installation of sump pumps in excavations.

Control of subsurface seepage at the base of fill areas can typically be accomplished by placement of an area drain. Underlying, saturated soil is typically removed and replaced with free draining, granular drain rock enveloped in geotextile fabric to an elevation above the encountered groundwater. Fill soil can be placed over the granular rock. NV5 should review proposed drainage improvements with regard to the site conditions prior to construction.

5.1.9 Soil Corrosion Potential

The project site soil corrosion potential was evaluated by Sunland Analytical on a soil sample collected at a depth of approximately 2.0 feet bgs from Boring B-2. Based on the limited tests (i.e., pH, resistivity, chloride, sulfate, and sulfide) the soil is moderately corrosive to buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron. All buried metallic piping should be protected against corrosion in accordance with the pipe manufacture recommendations. The laboratory report is included in Appendix C.

We reviewed the Online Soil Survey prepared by the USDA Soil Conservation Service (*https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx*). Based on review of soil survey information the native soil conditions onsite possess a low corrosion potential for concrete and a low corrosion potential for uncoated steel. To reduce the likelihood of corrosion problems, materials used for structural improvements should be selected based on local experience and practice. If alternative or new construction methods or materials are being proposed, it may be appropriate to have the selected materials evaluated by a corrosion engineer for compatibility with the onsite soil and groundwater conditions.

5.1.10 Grading Plan Review and Construction Monitoring

Coordination between the design team and the geotechnical engineer is recommended to assure that the design is compatible with the soil, geologic and groundwater conditions encountered during our study. NV5's experience, and that of the engineering profession, clearly indicates that during the construction phase of a project the risks of costly design, construction and maintenance problems can be significantly reduced by retaining a design geotechnical engineering firm to review the project plans and specifications and to provide geotechnical engineering consultation, observation and CQA testing services during construction. Construction quality assurance includes review of plans and specifications and performing construction monitoring as described below.

1. NV5 should be allowed to review the final earthwork grading improvement plans prior to commencement of construction to determine whether the recommendations have been implemented and, if necessary, to provide additional and/or modified recommendations.
2. Prior to commencing a new phase of construction, a meeting should be held at the site that includes, but is not limited to, the owner or owner's representative, the general contractor, the grading contractor, the foundation contractor, the underground contractor, any specialty contractors, the project civil engineer, other members of the project design team and NV5. This meeting should serve as a time to discuss and answer questions regarding the recommendations presented herein and to establish the coordination procedure between the contractors and NV5
3. Prior to commencement of a new phases of development on the site, NV5 should be retained to observe the soil/rock conditions within and surrounding the proposed improvements to confirm or modify our recommendations. A preconstruction meeting with the contractor and subcontractors involved should be held to discuss and review the applicable recommendations of this report as they apply to the proposed construction.
4. NV5 should be retained to perform construction quality assurance (CQA) monitoring of all earthwork grading performed by the contractor to determine whether our recommendations have been implemented, and if necessary, provide additional and/or modified recommendations. Upon your request we will prepare a CQA geotechnical engineering services proposal that will present a work scope, a tentative schedule and a fee estimate for your consideration and authorization. If NV5 is not retained to provide geotechnical engineering CQA services during the construction phase of the Project, then NV5 will not be responsible for geotechnical engineering CQA services provided by others nor any aspect of the Project that fails to meet your or a third party's expectations in the future.

5.2 STRUCTURAL IMPROVEMENT DESIGN CRITERIA

Our opinion is that the proposed helicopter parking area can be constructed of either asphaltic concrete (AC) or Portland cement concrete (PCC). PCC may perform better if the pad will be subjected to fuel trucks or heavy vehicles that may make short radius turns. PCC will be less susceptible to degradation from fuel spills.

5.2.1 Concrete Slab-on-Grade

Concrete slab-on-grade components are described below. If loads higher than 350 psf or intermittent live loads are anticipated, then a California-licensed structural engineer should design the necessary concrete slab-on-grade thickness and steel reinforcements.

1. <u>Minimum 6-Inch-Thick Concrete Slab</u>: The concrete slab should be installed with a minimum 3,000 pounds per square inch (psi) compressive strength after 28 days of curing. NV5 recommends that the concrete design have a water/cement ratio no greater than 0.45 and should be placed with minimum and maximum slumps of 3 and 5 inches, respectively. Pozzolans or other additives may be added to increase workability. The concrete mix design is the responsibility of the concrete supplier.
2. <u>Steel Reinforcement</u>: Reinforcement should be used to improve the load-carrying capacity, to reduce cracking caused by shrinkage during curing and from both differential and repeated loadings. It should be understood that it is nearly impossible to prevent all cracks from development in concrete slabs; in other words, it should be expected that some cracking will occur in all concrete slabs no matter how well they are reinforced. Concrete slabs that will be subjected to heavy loads should be designed with steel reinforcements by a California-licensed structural engineer.
3. <u>Rebar</u>: As a minimum, use No. 3 rebar (ASTM A615/A 615M-04 Grade 60), tied and placed with minimum 18-inch centers in both directions (perpendicular) and supported on concrete “dobies” to position the rebar in the center of the slab during concrete pouring. "Hooking and pulling" of steel during concrete placement is not recommended.
4. <u>Minimum 4-Inch-Thick Crushed Rock or Class II Aggregate Base Rock Layer</u>: The slab should be underlain by either crushed rock or Class II AB rock. Crushed rock should be mechanically consolidated under the observation of NV5. AB rock layers should be placed and compacted to a minimum of 95 percent of the ASTM D1557 dry density with a moisture content of ± 3 percentage points of the ASTM D1557 optimum moisture content. The crushed rock should be washed to produce a particle size distribution of 100 percent (by dry weight) passing the ¾ inch sieve and 5 percent passing the No. 4 sieve and 0 to 3 percent passing the No. 200 sieve. An alternative rock material would include AB rock meeting the specification of Caltrans Class II AB. Just prior to pouring the concrete slab, the rock layer should be moistened to a saturated surface dry (SSD) condition. This measure will reduce the potential for water to be withdrawn from the bottom of the concrete slab while it is curing and will help minimize the development of shrinkage cracks.

5. Subgrade Soil Preparation: The subgrade soil should be prepared and compacted consistent with the recommendations of Section 5.1. The top 6 inches of the non-expansive soil should be compacted to a minimum of 95 percent of the ASTM D1557 dry density with relatively uniform moisture content within $\pm$ 3 percentage points of the ASTM D1557 optimum moisture content. Prior to placing slab rock, subgrade soil must be moisture conditioned to between 75 and 90 percent saturation to a depth of 24 inches. Moisture conditioning should be performed for a minimum of 24 hours prior to concrete placement. Clayey soil may take up to 72 hours to reach this required degree of saturation. If the soil is not moisture conditioned prior to placing concrete, moisture will be wicked out of the concrete, possibly contributing to shrinkage cracks. Additionally, our opinion is that moisture conditioning the soil prior to placing concrete will reduce the likelihood of soil swell or heave following construction at locations where fine grained, potentially expansive soil is encountered. To facilitate slab-on-grade construction, we recommend that the slab subgrade soil be moisture conditioned following rock placement.
6. Crack Control Grooves: Crack control grooves should be installed during placement or saw cuts should be made in accordance with the ACI and Portland Cement Association (PCA) specifications. Generally, NV5 recommends that crack control grooves or saw cuts are installed on 10-foot-centers in both directions (perpendicular).
7. Concrete slabs should be moisture cured for at least seven days after placement. Excessive curling of the slab may occur if moisture conditioning is not performed. This is especially critical for slabs that are cast during the warm summer months.
8. The subgrade soil around the slabs-on-grade should be sloped away from the proposed slab subgrade a minimum of 2 percent for a distance of 10 feet as discussed in the “Surface Water Drainage” section of this report.
9. Field observations of all concrete slab-on-grade surfaces and installed steel reinforcements should be made by an NV5 construction monitor prior to pouring concrete.

These recommendations do not address vapor intrusion through the slab. We should be notified if conditioned space is proposed for the proposed helicopter parking area.

5.2.2 Asphaltic Pavement

The following recommended asphalt concrete flexible pavement sections are based on a design R-value of 12 and traffic indices (TIs) of 5 and 6. This is suitable for occasional fueling trucks, light traffic, and helicopters. Pavement design is presented in Table 5.2.2-1.

Table 5.2.2-1 - Recommended Pavement Sections

Traffic Index: 5 **Design R-Value: 12**	**Pavement Section (inches)**
Caltrans Section 39, Standard Specifications Asphalt Concrete	3.0
Caltrans Section 26, Class 2 Baserock 95% compaction	9.5
Subgrade 95% compaction	12.0
Traffic Index: 6 **Design R-Value: 12**	**Pavement Section (inches)**
Caltrans Section 39, Standard Specifications Asphalt Concrete	3.5
Caltrans Section 26, Class 2 Baserock 95% compaction	12.0
Subgrade 95% compaction	12.0

6.0 LIMITATIONS

The following limitations apply to the findings, conclusions and recommendations presented in this report:

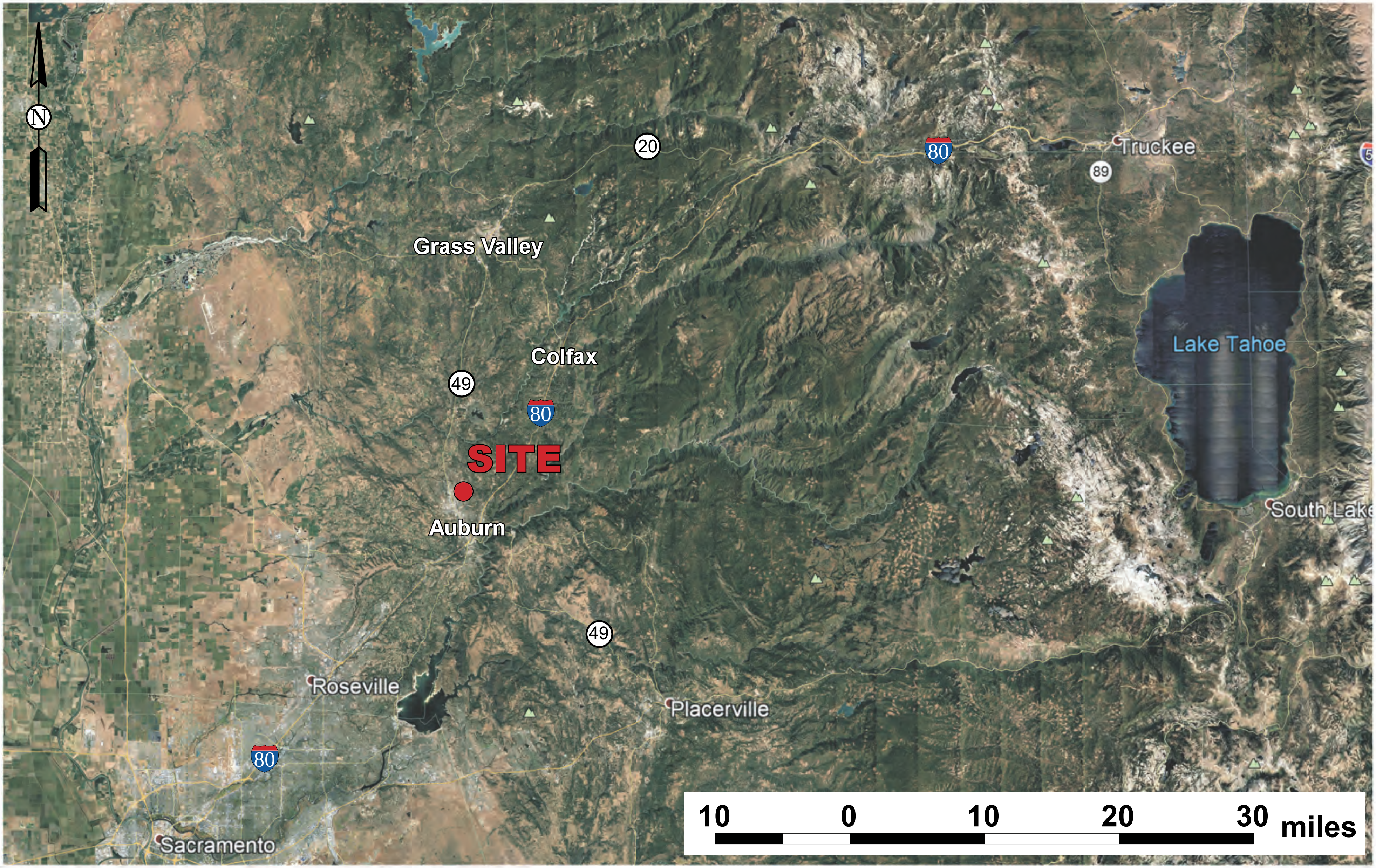
1. Our professional services were performed consistent with the generally accepted geotechnical engineering principles and practices employed in northern California. No warranty is expressed or implied.

2. These services were performed consistent with our agreement with our client. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of our services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report. This report is solely for the use of our client unless noted otherwise. Any reliance on this report by a third party is at the party's sole risk.

3. If changes are made to the nature or design of the project as described in this report, then the conclusions and recommendations presented in this report should be considered invalid. Only our firm can determine the validity of the conclusions and recommendations presented in this report. Therefore, we should be retained to review all project changes and prepare written responses with regards to their impacts on our conclusions and recommendations. However, we may require additional fieldwork and laboratory testing to develop any modifications to our recommendations. Costs to review project changes and perform additional fieldwork and laboratory testing necessary to modify our recommendations are beyond the scope of services presented in this report. Any additional work will be performed only after receipt of an approved scope of services, budget, and written authorization to proceed.

4. The analyses, conclusions and recommendations presented in this report are based on site conditions as they existed at the time we performed our surface and subsurface field investigations. We have assumed that the subsurface soil and groundwater conditions encountered at the location of our exploratory trenches are generally representative of the subsurface conditions throughout the entire project site. However, the actual subsurface conditions at locations between and beyond our exploratory borings may differ. Therefore, if the subsurface conditions encountered during construction are different than those described in this report, then we should be notified immediately so that we can review these differences and, if necessary, modify our recommendations.
5. The elevation or depth to groundwater underlying the project site may differ with time and location.
6. The project site map shows approximate boring locations as determined by pacing distances from identifiable site features. Therefore, the trench locations should not be relied upon as being exact nor located with surveying methods.
7. Our geotechnical investigation scope of services did not include evaluating the project site for the presence of hazardous materials. Although we did not observe hazardous materials within the proposed improvement area at the time of our field investigation, all project personnel should be careful and take the necessary precautions should hazardous materials be encountered during construction.
8. The findings of this report are valid as of the present date. However, changes in the conditions of the property can occur with the passage of time. The changes may be due to natural processes or to the works of man, on the project site or adjacent properties. In addition, changes in applicable or appropriate standards can occur, whether they result from legislation or the broadening of knowledge. Therefore, the recommendations presented in this report should not be relied upon after a period of two years from the issue date without our review.

FIGURES



Reference: Google Earth, Imagery Date: 12/30/2016, Accessed: 10/12/2020

Scale:1" = 10 miles

NV5

792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

SITE LOCATION MAP

Project Name: AUBRUN AIRPORT HELIPAD

Location: AUBURN, CALIFORNIA

Project No.: 3783A.00

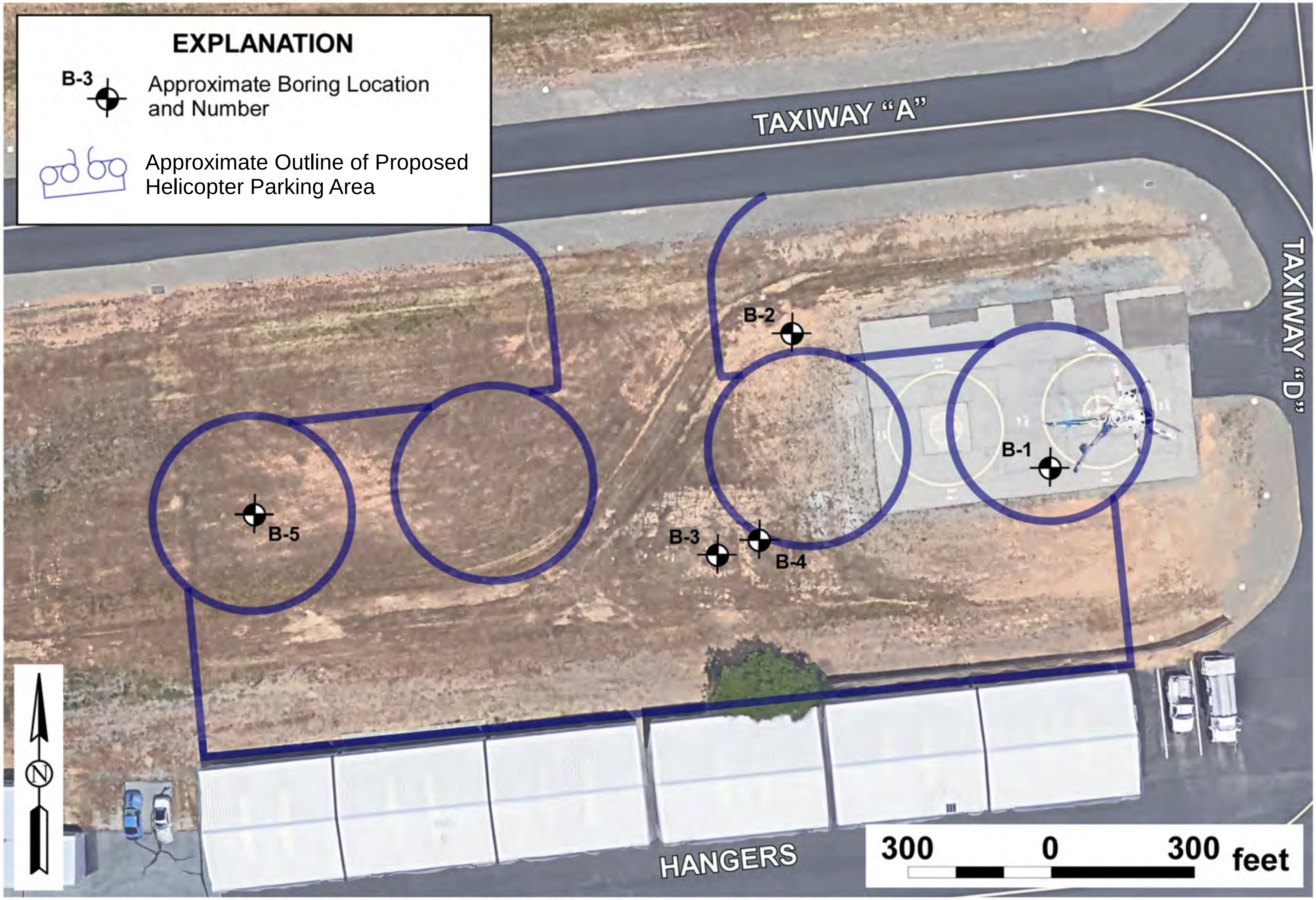
Date: OCTOBER 2020

Drawn By: WAL

Checked By: JSS

FIGURE

1



Reference: Google Earth, Imagery Date: 9/11/2019, Accessed: 10/12/2020

Scale:1" =300'

NV5 792 Searls Avenue, Nevada City, California, 95959 PHONE: 530-478-1305, FAX: 530-478-1019	**EXPLORATION MAP** Project Name: AUBURN AIRPORT HELIPAD Location: AUBURN, CALIFORNIA Project No.: 3783A.00	Date: OCTOBER 2020 Drawn By: WAL Checked By: JSS	FIGURE **2**

APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

(Included with Permission of GBA, copyright 2016)

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX B

EXPLORATORY BORING LOGS

EXPLORATORY BORING LOG

NV5
792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

Boring No. B1

Project Name: AUBURN AIRPORT HELIPAD | **Project No.:** 3783A.00 | **Task:** - | **Start:** 10/12/2020

Location: AUBURN, CALIFORNIA | **Ground Elev. (Ft. MSL):** 1495 | **Finish:** 10/12/2020 | **Sheet:** 1 of 1

Logged By: J. SMITH | **Drilling Company:** H1 DRILLING | **Drill Rig Type:** TRUCK-MOUNTED MOBILE

Driller: R. HUMPHREYS | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140-LB AUTO-TRIP

Boring Dia. (In.): 3.25 | **Total Depth (Ft.):** 15.5 | **Backfill or Well Casing:** GROUT WITH ASPHALT PATCH

Ground Water Information

Date	-			
Time	-			
Depth (ft)	NFWE			

Soil and/or Rock Descriptions
(USCS Symbol; USCS Name; Field Estimated Particle Size Gradation (%); Munsel Color; Density/Consistency; Moisture; Fill Material; Dilatancy; Plasticity Toughness; Dry Strength; Structure; Cementation; Organics; Odor; Other)

Time (H:M)	Pocket Penetrometer (TSF)	SPT Blow Counts (Blows / Foot)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
11:41			HSA							2" ASPHALT
						1				7" AB
					B1-C1					(Rx) ULTRAMAFIC ROCKS; SERPENTINIZED, PERIODOTITES AND PYROXENITES W/ ALTERATIONS TO SERPANTINE, TALC, AND CHLORITE, AND OCCASIONAL FURRUGINOUS COATING; COMPLETELY TO MODERATELY WEATHERED; MODERATELY TO VERY STRONG; PALE OLIVE (10Y-5GY 6/4), LIGHT OLIVE (10Y-5GY 5/4), GREENISH GRAY (GLEY 1 5/1), WITH DARK YELLOWISH BROWN (10YR 3/6); GENERALLY EXCAVATES AS (SM) SANDY SILT, LIGHT GRAY TO LIGHT YELLOWISH BROWN.
						2				
			SPT		B1-BK1					
						3				
		61								
			HSA			4				
						5				
			SPT		B1-BK2					
						6				
		57								
			HSA			7				
						8				
						9				
						10				
			SPT		B1-BK3					
						11				
		51								[EXTREMELY OXIDIZED]
			HSA			12				
						13				
						14				
						15				
12:19		78+	SPT		B1-BK4					
						16		BOH		BOH AT 15.5'
						17				
						18				
						19				
						20				

NOTES: BOH = BOTTOM OF HOLE
BGS = BELOW GROUND SURFACE
NFWE = NO FREE WATER ENCOUNTERED
HSA = HOLLOW STEM AUGER
MC = MODIFIED CALIFORNIA SAMPLER
SPT = STANDARD PENETRATION TEST SAMPLER

EXPLORATORY BORING LOG

792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

Boring No. B2

Project Name: AUBURN AIRPORT HELIPAD	**Project No.:** 3783A.00	**Task:** -	**Start:** 10/12/2020
Location: AUBURN, CALIFORNIA	**Ground Elev. (Ft. MSL):** 1495		**Finish:** 10/12/2020
			Sheet: 1 of 1
Logged By: J. SMITH	**Drilling Company:** H1 DRILLING	**Drill Rig Type:** TRUCK-MOUNTED MOBILE	
Driller: R. HUMPHREYS	**Drilling Method:** HOLLOW STEM AUGER	**Hammer Type:** 140-LB AUTO-TRIP	
Boring Dia. (In.): 3.25	**Total Depth (Ft.):** 5.5	**Backfill or Well Casing:** CUTTINGS	

Ground Water Information

Date	-			
Time	-			
Depth (ft)	NFWE			

Time (H:M)	Pocket Penetrometer (TSF)	SPT Blow Counts (Blows / Foot)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions (USCS Symbol; USCS Name; Field Estimated Particle Size Gradation (%); Munsel Color; Density/Consistency; Moisture; Fill Material; Dilatancy; Plasticity Toughness; Dry Strength; Structure; Cementation; Organics; Odor; Other)
10:21			HSA							(CL) CLAY WITH SAND; FIELD ESTIMATE: 80% FINES, 20% SAND; REDDISH BROWN (5YR 4/4); DRY; STIFF TO HARD.
						1				
			SPT		B2-BK1					(CH) FAT CLAY WITH SAND; FIELD ESTIMATE: 80-90% FINES, 10-20% SAND; GRAYISH BROWN (2.5Y 5/2) TO (7.5YR 4/3); DAMP TO MOIST; FIRM TO STIFF; RESIDUAL SOIL.
		78+			B2-C1	2				
			HSA							(Rx) ULTRAMAFIC ROCKS; SERPENTINIZED, PERIODOTITES AND PYROXENITES W/ ALTERATIONS TO SERPANTINE, TALC, AND CHLORITE, AND OCCASIONAL FURRUGINOUS COATING; COMPLETELY TO MODERATELY WEATHERED; MODERATELY TO VERY STRONG; PALE OLIVE (10Y-5GY 6/4), LIGHT OLIVE (10Y-5GY 5/4), GREENISH GRAY (GLEY 1 5/1), WITH DARK YELLOWISH BROWN (10YR 3/6); GENERALLY EXCAVATES AS (SM) SANDY SILT, LIGHT GRAY TO LIGHT YELLOWISH BROWN.
						3				
						4				
						5				
10:44		78+	SPT		B2-BK2					
						6		BOH		BOH AT 5.5' DUE TO REFUSAL ON ROCK
						7				
						8				
						9				
						10				
						11				
						12				
						13				
						14				
						15				
						16				
						17				
						18				
						19				
						20				

NOTES: BOH = BOTTOM OF HOLE; BGS = BELOW GROUND SURFACE; NFWE = NO FREE WATER ENCOUNTERED; HSA = HOLLOW STEM AUGER; MC = MODIFIED CALIFORNIA SAMPLER; SPT = STANDARD PENETRATION TEST SAMPLER

EXPLORATORY BORING LOG

792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

Boring No. B3

Project Name: AUBURN AIRPORT HELIPAD	**Project No.:** 3783A.00	**Task:** -	**Start:** 10/12/2020
Location: AUBURN, CALIFORNIA	**Ground Elev. (Ft. MSL):** 1495		**Finish:** 10/12/2020
Logged By: J. SMITH	**Drilling Company:** H1 DRILLING	**Drill Rig Type:** TRUCK-MOUNTED MOBILE	**Sheet:** 1 of 1
Driller: R. HUMPHREYS	**Drilling Method:** HOLLOW STEM AUGER	**Hammer Type:** 140-LB AUTO-TRIP	
Boring Dia. (In.): 3.25	**Total Depth (Ft.):** 15.75	**Backfill or Well Casing:** CUTTINGS	

Ground Water Information

Date	-			
Time	-			
Depth (ft)	NFWE			

Soil and/or Rock Descriptions
(USCS Symbol; USCS Name; Field Estimated Particle Size Gradation (%); Munsel Color; Density/Consistency; Moisture; Fill Material; Dilatancy; Plasticity Toughness; Dry Strength; Structure; Cementation; Organics; Odor; Other)

Time (H:M)	Pocket Penetrometer (TSF)	SPT Blow Counts (Blows / Foot)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Soil and/or Rock Descriptions
10:52			HSA			0–2	(CL) CLAY WITH SAND; FIELD ESTIMATE: 80% FINES, 20% SAND; REDDISH BROWN (5YR 4/4); DRY; STIFF TO HARD.
						1–2	(CH) FAT CLAY WITH SAND; FIELD ESTIMATE: 80-90% FINES, 10-20% SAND; GRAYISH BROWN (2.5Y 5/2) TO (7.5YR 4/3); DAMP TO MOIST; FIRM TO STIFF; RESIDUAL SOIL.
			SPT		B3-BK1	2	(Rx) ULTRAMAFIC ROCKS; SERPENTINIZED, PERIODOTITES AND PYROXENITES W/ ALTERATIONS TO SERPANTINE, TALC, AND CHLORITE, AND OCCASIONAL FURRUGINOUS COATING; COMPLETELY TO MODERATELY WEATHERED; MODERATELY TO VERY STRONG; PALE OLIVE (10Y-5GY 6/4), LIGHT OLIVE (10Y-5GY 5/4), GREENISH GRAY (GLEY 1 5/1), WITH DARK YELLOWISH BROWN (10YR 3/6); GENERALLY EXCAVATES AS (SM) SANDY SILT, LIGHT GRAY TO LIGHT YELLOWISH BROWN.
		42				3.5	
			HSA			3.5	
			SPT		B3-BK2	5	
			HSA			5.5	
		62				6	
			SPT		B3-BK3	10	
11:11		78				11	
			HSA			11.5	
			SPT		B3-BK4	15	
		78+				15.5	
						15.75	BOH — BOH AT 15.75'

NOTES: BOH = BOTTOM OF HOLE; BGS = BELOW GROUND SURFACE; NFWE = NO FREE WATER ENCOUNTERED; HSA = HOLLOW STEM AUGER; MC = MODIFIED CALIFORNIA SAMPLER; SPT = STANDARD PENETRATION TEST SAMPLER

EXPLORATORY BORING LOG

792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

Boring No. B4

Project Name: AUBURN AIRPORT HELIPAD	**Project No.:** 3783A.00	**Task:** -	**Start:** 10/12/2020
Location: AUBURN, CALIFORNIA	**Ground Elev. (Ft. MSL):** 1495		**Finish:** 10/12/2020
Sheet: 1 of 1			
Logged By: J. SMITH	**Drilling Company:** H1 DRILLING	**Drill Rig Type:** TRUCK-MOUNTED MOBILE	
Driller: R. HUMPHREYS	**Drilling Method:** HOLLOW STEM AUGER	**Hammer Type:** 140-LB AUTO-TRIP	
Boring Dia. (In.): 3.25	**Total Depth (Ft.):** 2.5	**Backfill or Well Casing:** CUTTINGS	

Ground Water Information

Date	-			
Time	-			
Depth (ft)	NFWE			

Time (H:M)	Pocket Penetrometer (TSF)	SPT Blow Counts (Blows / Foot)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log
12:35			HSA						
						1			
			MC	0.5/1.5'	B4-L1				
						2			
12:41		34							
						3		BOH	
						4			
						5			
						6			
						7			
						8			
						9			
						10			
						11			
						12			
						13			
						14			
						15			
						16			
						17			
						18			
						19			
						20			

Soil and/or Rock Descriptions

(USCS Symbol; USCS Name; Field Estimated Particle Size Gradation (%); Munsel Color; Density/Consistency; Moisture; Fill Material; Dilatancy; Plasticity Toughness; Dry Strength; Structure; Cementation; Organics; Odor; Other)

(CL) CLAY WITH SAND; FIELD ESTIMATE: 80% FINES, 20% SAND; REDDISH BROWN (5YR 4/4); DRY; STIFF TO HARD.

(CH) FAT CLAY WITH SAND; FIELD ESTIMATE: 80-90% FINES, 10-20% SAND; GRAYISH BROWN (2.5Y 5/2) TO (7.5YR 4/3); DAMP TO MOIST; FIRM TO STIFF; RESIDUAL SOIL.

(Rx) ULTRAMAFIC ROCKS; SERPENTINIZED, PERIODOTITES AND PYROXENITES W/ ALTERATIONS TO SERPANTINE, TALC, AND CHLORITE, AND OCCASIONAL FURRUGINOUS COATING; COMPLETELY TO MODERATELY WEATHERED; MODERATELY TO VERY STRONG; PALE OLIVE (10Y-5GY 6/4), LIGHT OLIVE (10Y-5GY 5/4), GREENISH GRAY (GLEY 1 5/1), WITH DARK YELLOWISH BROWN (10YR 3/6); GENERALLY EXCAVATES AS (SM) SANDY SILT, LIGHT GRAY TO LIGHT YELLOWISH BROWN.

BOH AT 2.5' DUE TO REFUSAL ON ROCK

NOTES: BOH = BOTTOM OF HOLE; BGS = BELOW GROUND SURFACE; NFWE = NO FREE WATER ENCOUNTERED; HSA = HOLLOW STEM AUGER; MC = MODIFIED CALIFORNIA SAMPLER; SPT = STANDARD PENETRATION TEST SAMPLER

EXPLORATORY BORING LOG

792 Searls Avenue, Nevada City, California, 95959
PHONE: 530-478-1305, FAX: 530-478-1019

Boring No. B5

Project Name: AUBURN AIRPORT HELIPAD	**Project No.:** 3783A.00	**Task:** -	**Start:** 10/12/2020
Location: AUBURN, CALIFORNIA	**Ground Elev. (Ft. MSL):** 1495		**Finish:** 10/12/2020
			Sheet: 1 of 1
Logged By: J. SMITH	**Drilling Company:** H1 DRILLING	**Drill Rig Type:** TRUCK-MOUNTED MOBILE	
Driller: R. HUMPHREYS	**Drilling Method:** HOLLOW STEM AUGER	**Hammer Type:** 140-LB AUTO-TRIP	
Boring Dia. (In.): 3.25	**Total Depth (Ft.):** 9.25	**Backfill or Well Casing:** CUTTINGS	

Ground Water Information

Date	-			
Time	-			
Depth (ft)	NFWE			

Time (H:M)	Pocket Penetrometer (TSF)	SPT Blow Counts (Blows / Foot)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions (USCS Symbol; USCS Name; Field Estimated Particle Size Gradation (%); Munsel Color; Density/Consistency; Moisture; Fill Material; Dilatancy; Plasticity Toughness; Dry Strength; Structure; Cementation; Organics; Odor; Other)
12:49			HSA			0–2				(CL) CLAY WITH SAND; FIELD ESTIMATE: 80% FINES, 20% SAND; REDDISH BROWN (5YR 4/4); DRY; STIFF TO HARD.
			MC	0.5/1.5'	B5-L1	2.5				(Rx) ULTRAMAFIC ROCKS; SERPENTINIZED, PERIODOTITES AND PYROXENITES W/ ALTERATIONS TO SERPANTINE, TALC, AND CHLORITE, AND OCCASIONAL FURRUGINOUS COATING; COMPLETELY TO MODERATELY WEATHERED; MODERATELY TO VERY STRONG; PALE OLIVE (10Y-5GY 6/4), LIGHT OLIVE (10Y-5GY 5/4), GREENISH GRAY (GLEY 1 5/1), WITH DARK YELLOWISH BROWN (10YR 3/6); GENERALLY EXCAVATES AS (SM) SANDY SILT, LIGHT GRAY TO LIGHT YELLOWISH BROWN.
		78+				3				
			HSA			3.5				
			SPT			5.5				
		78+				6				
			HSA			6.5				
13:21		78+	SPT			9				
						9.25		BOH		BOH AT 5.5' DUE TO REFUSAL ON ROCK

NOTES: BOH = BOTTOM OF HOLE; BGS = BELOW GROUND SURFACE; NFWE = NO FREE WATER ENCOUNTERED; HSA = HOLLOW STEM AUGER; MC = MODIFIED CALIFORNIA SAMPLER; SPT = STANDARD PENETRATION TEST SAMPLER

APPENDIX C

LABORATORY TEST DATA

ATTERBERG INDICES

ASTM D4318

DSA File #:

DSA Appl #:

Project No.:	**3783A.00**	Project Name:	**AUN New Helicopter Parking**	Date:	**10/22/2020**
Sample No.:	**B4-L1**	Boring/Trench: **B4**	Depth, (ft.): **-**	Tested By:	**GWO/SLN**
Description:	**Brown (7.5YR 4/3) Fat Clay with Sand**			Checked By:	**MLH**
Sample Location:				Lab. No.:	**15-20-529**

Estimated % of Sample Retained on No. 40 Sieve: 5

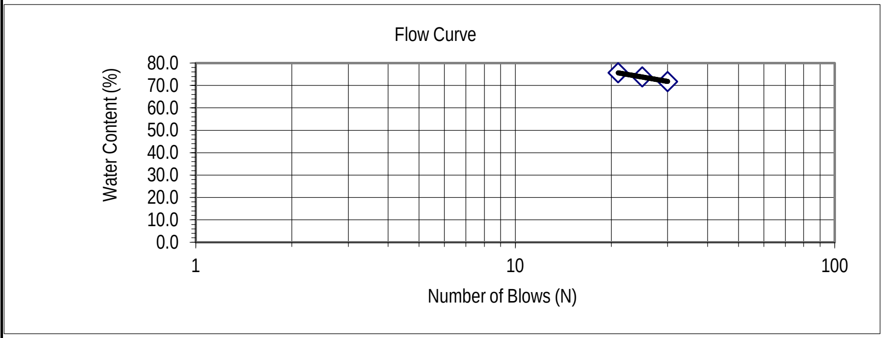
Sample Air Dried: yes

Test Method A or B: A

	LIQUID LIMIT:					PLASTIC LIMIT:		
Sample No.:	1	2	3	4	5	1	2	3
Pan ID:	2	T	22			B	PI	
Wt. Pan (gr)	15.29	15.04	15.32			15.36	15.30	
Wt. Wet Soil + Pan (gr)	21.32	20.15	21.01			21.36	21.37	
Wt. Dry Soil + Pan (gr)	18.80	17.98	18.56			20.27	20.26	
Wt. Water (gr)	2.52	2.17	2.45			1.09	1.11	
Wt. Dry Soil (gr)	3.51	2.94	3.24			4.91	4.96	
Water Content (%)	71.8	73.8	75.6			22.2	22.4	
Number of Blows, N	30	25	21					

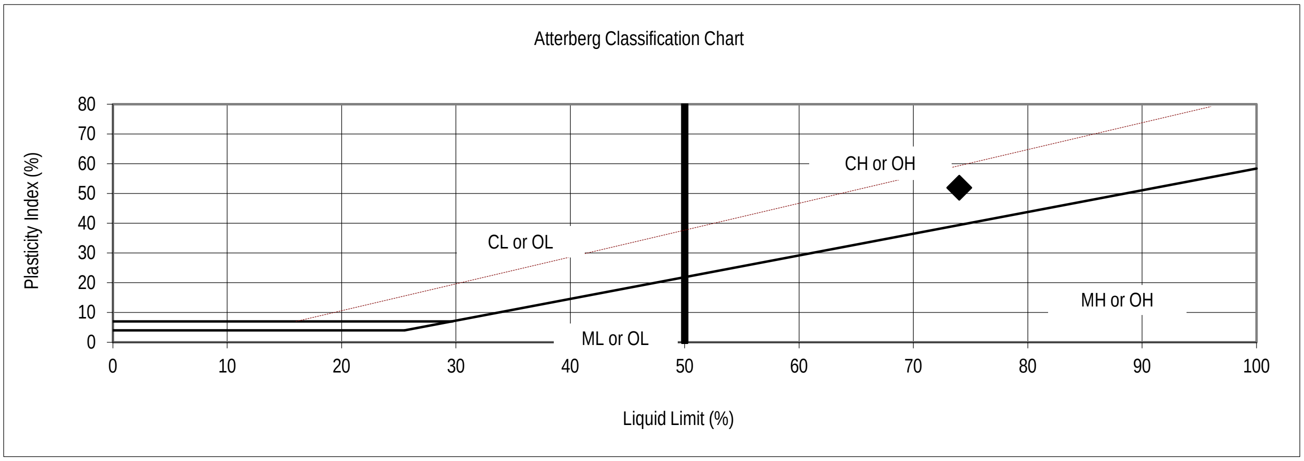
LIQUID LIMIT = 74

PLASTIC LIMIT = 22



Plasticity Index = 52

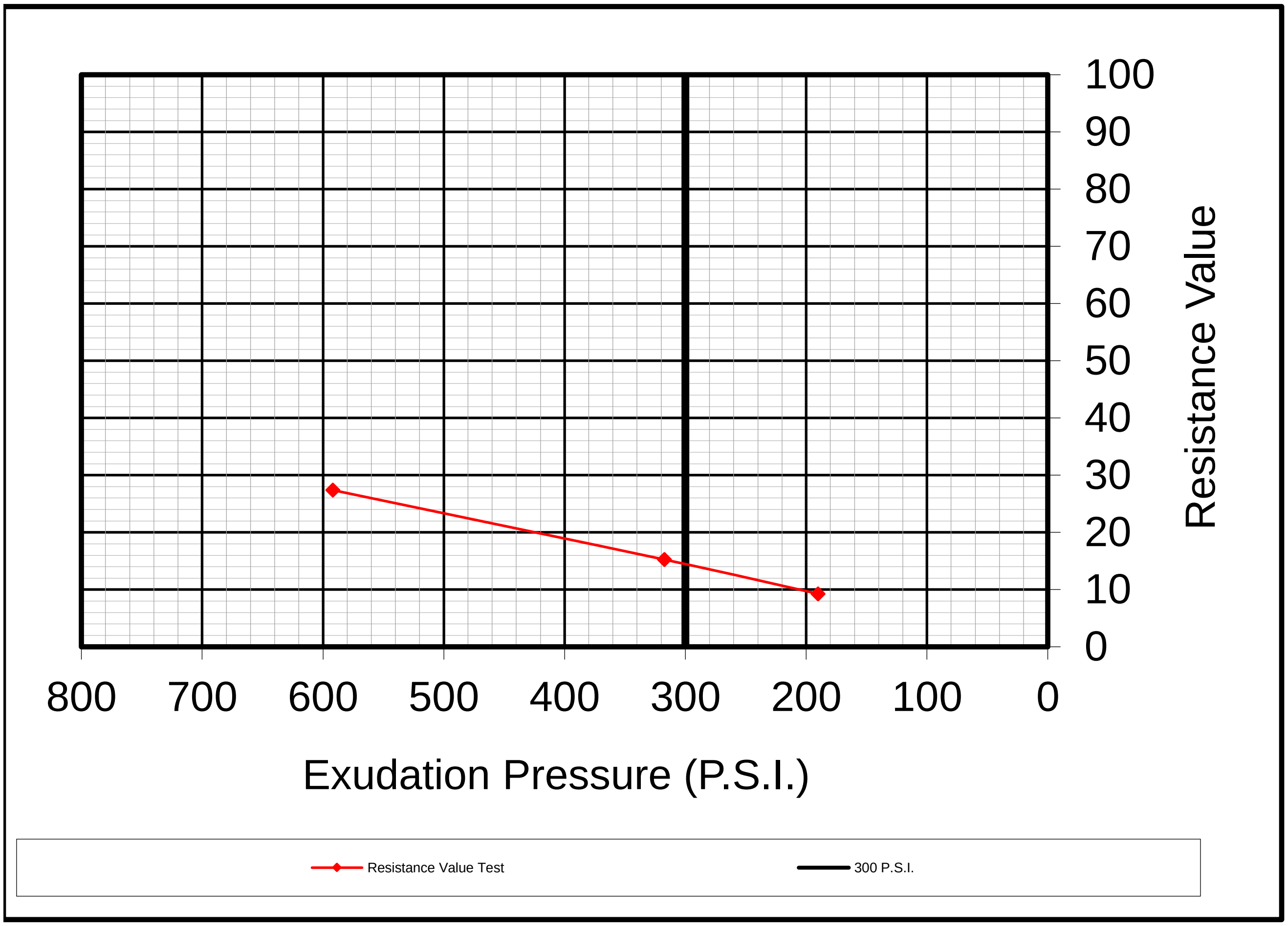
Group Symbol = CH



Pavement Engineering Inc.
Redding • Sacramento • San Luis Obispo
Concord • Santa Clarita

RESISTANCE (R) VALUE TEST
California Test 301

PEI Laboratory No.:	L202791	**NV5 Project Name:**	AUN New Helicoptor Parking
PEI Client:	NV5 (Holdrege & Kull)	**NV5 Project No.:**	3783A.00
PEI Project Name:	2020 Laboratory Testing	**NV5 Date Sampled:**	10/15/2020
PEI Project No.:	200018-01	**NV5 Office:**	Nevada City
Report Date:	October 19, 2020	**NV5 Engineer:**	John Atkinson
Sample Description:	Brown Clay (comp of B1 & B2)	**NV5 PO No.:**	15-20-529
		NV5 Sample ID:	



Specimen No.	7	8	9
Moisture Content (%)	16.0	17.2	15.5
Dry Density (PCF)	117.1	115.8	119.4
Resistance Value (R)	15	9	27
Exudation Pressure (PSI)	317	190	592
Expansion Pressure	152	91	255
As Received Moisture Content (%)	16.0		

RESISTANCE VALUE AT 300 P.S.I. **14**

AASHTO R18

Reviewed By:

Brandon Rodebaugh
Materials Engineer

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 10/21/2020
Date Submitted 10/16/2020

To: Michelle Holub
Holdrege & Kull
792 Searls Ave.
Nevada City, CA 95959

From: Gene Oliphant, Ph.D. \ Randy Horney RA
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3783A.000 Site ID : B3-BK1.
Your purchase order number is 1520529.
Thank you for your business.

* For future reference to this analysis please use SUN # 83268-173768.

EVALUATION FOR SOIL CORROSION

Soil pH	6.26	
Minimum Resistivity	1.45 ohm-cm (x1000)	
Chloride	2.3 ppm	00.00023 %
Sulfate	5.1 ppm	00.00051 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

THIS PAGE INTENTIONALLY LEFT BLANK